OFFICIAL PUBLICATION OF THE PROCEEDINGS AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

AMERICAN

DYESTUFF REPORTER

DEVOTED TO TEXTILE CHEMISTRY · BLEACHING · DYEING · PRINTING · FINISHING

OCTOBER 2, 1950
VOLUME 39, No. 20

10-9

Vat Colors
for cotton shirtings

For the best in all-round fastness properties—use vat colors. Du Pont vats are suitable for all types of application. They're available in a wide range of shades for printing, duplex printing and over-printing—and for dyeing. They have the same fastness whether applied to yarn or piece goods.

Du Pont offers Ponsol*—anthraquinone-type dyes—and Leucosol*—specially prepared anthraquinone types for printing. Our Technical Staff will assist in solving your problems. E. I. du Pont de Nemours & Co. (Inc.), Dyestuffs Division, Wilmington 98, Delaware.

*REG. U. S. PAT. OFF.

Du Pont Dyestuffs

DU PONT
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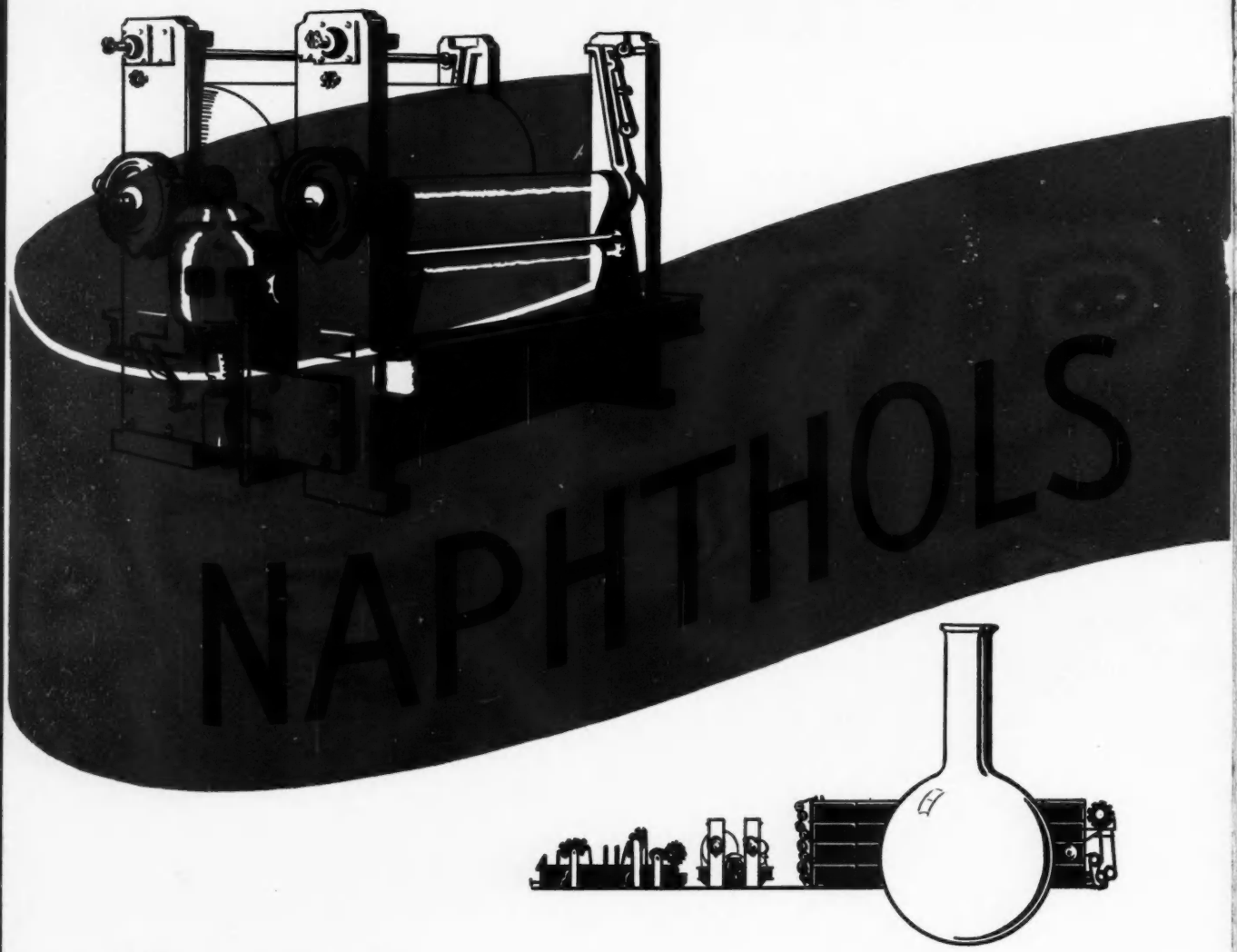
BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY



Wherever you find
the textile industry—
you will find
Napthols and Beta Oxy Naphtholic Acid . . .

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Pfister Chemical Works

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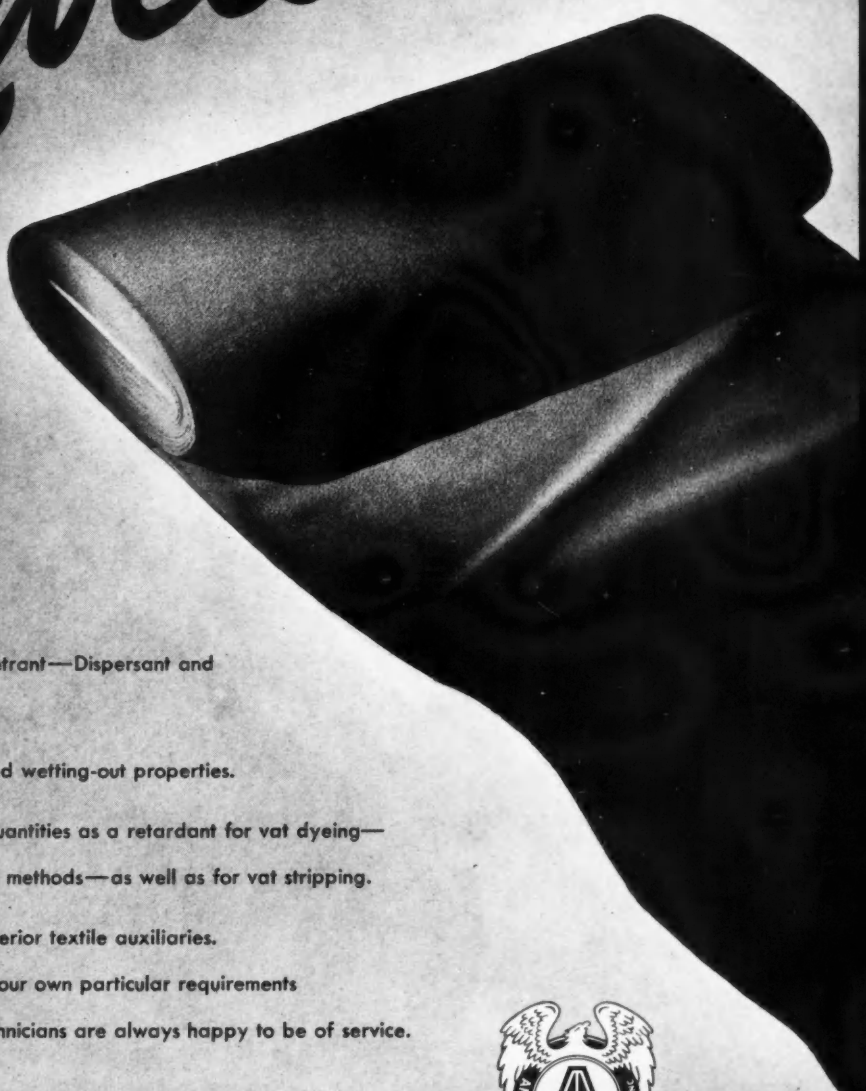
A Textile Utility
Product of
Wide Application

NEWLY IMPROVED!!!
now a *four star* product

Levelene*



★ wetting-out
★ preparing
★ dyeing
★ finishing

An effective Leveling agent—Penetrant—Dispersant and active Stripping Catalyzer.

New Levelene has greatly improved wetting-out properties.

Particularly well suited in minute quantities as a retardant for vat dyeing—either in the pigment pad or reduced methods—as well as for vat stripping.

Another of the A.A.P. range of superior textile auxiliaries.
For detailed information regarding your own particular requirements consult our nearest branch. A.A.P. technicians are always happy to be of service.

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Chattanooga, Tenn. • **Dominion Anilines & Chemicals Ltd.** • Toronto, Canada • Montreal, Canada

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The Fabric that Travels Farthest is the One that's Processed Best!

Designers who travel far know that for successful designs, it is of utmost importance that they depart with fabrics that have been cleared through proper processing. That explains why so many of America's leading mills, converters, finishers and dyers have turned to Colgate-Palmolive-Peet for high-quality wetting, fulling, scouring and dispersing agents.

Remember, there is a C.P.P. soap or synthetic detergent for every type of fabric—for every processing problem. Ask your local Colgate-Palmolive-Peet representative for details. Or, write today to Industrial Dept., Colgate-Palmolive-Peet Company.

COLGATE FORMULA 25

For low-temperature washing ordinarily requiring olive oil soaps. Sold in eastern states only.

COLGATE WHITE SOAP FLAKES

High-grade thin white flakes. Not milled or polished. 90% anhydrous soap.

ARCTIC CRYSTAL FLAKES

Made from pure tallow, guaranteed to contain 88% or more soap. Titer approx. 42°C.

ARCTIC SYNTEX A, T, AND M

Synthetic detergents and wetting agents. Unsurpassed for many processing operations.

COLGATE FORMULA 10

92% oleic acid soda soap in flake form for silk degumming, wool scouring, all textile processing.

MENTOR BEADS

An alkyl aryl sulfonate detergent . . . of high purity . . . stable in acid and alkali . . . outstanding detergent and wetting properties.

This tailored suiting is of diamond weave sharkskin with colorful overplaid. It is 100% worsted and comes in gray and beige.

FREE! New 1950 Handy Soap Buying Guide. Tells you the right soap for every purpose! See your C.P.P. representative, or write to our Industrial Department.

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Newsworthy onyx Chemicals

FOR TEXTILE PROCESSING

Previously Mentioned...

Gas Fading Protection On a 3-Cycle Basis

Onyx Neufume DMX and Neufume NS, used *together*, provide eminently satisfactory protection against gas fading for all types of acetate constructions *on a 3-cycle basis*. Neufume DMX is added to the dye liquor. Dyed goods are rinsed and dried. Then they are finished with Neufume NS. Neufume DMX alone prevents fading action, with exceptional resistance to washing and dry cleaning. Neufume NS alone gives good resistance with less durability. The two together provide the unusual resistance to washing and dry cleaning typified by the 3-cycle standard.

No More Bleeding On Your Prints

Even on colors that have given you trouble in the past, you will have no difficulties with dye migration or bleeding when you use Xynofix FL in the final print wash or the final rinse after printing. You can easily see for yourself what Xynofix FL will do for you, by making a test run. We shall be glad to cooperate on any basis you feel is suitable.

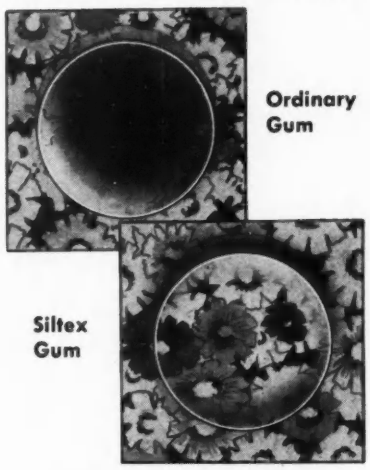
THE Duller For Dark Shades

Dullatone* DG produces dull, soft tones on dark shades without imparting a harsh hand. It is just as effective on these goods as Dullatone* CA has been for so long a time on the light shades. Dulling for all types of rayon, acetate and nylon piece goods, in any shades, can thus be imparted with a suitable Onyx Dullatone* Remember that both Dullatone* DG and Dullatone* CA can be run for long periods without build-up on rolls, or streaking of the goods.

*Trade Mark Reg. U. S. Pat. Off.

The Standard of Comparison on Printing Gums

Onyx Siltex Gum. Superconcentrated, is not a new product . . . but it is newsworthy because of its superior performance and the advantages it offers the textile printer in this busy season.



Compare the darkening and muddying effect of ordinary printing gum on the upper watch crystal with the clarity and transparency of Siltex Gums on the lower crystal.

Siltex Gum, Superconcentrated, is the most effective printing gum available. It is the standard of comparison in checking results from all other gums. It insures purer whites and better color yield, because it is completely transparent and virtually water-white. It is a perfect gum for fine line work.

Lime-free, this gum has no grit to damage rolls or doctor blades. It gives you perfect penetration. It does not froth during runs, and does not thin out, retaining its exceptionally high viscosity all the way. It is also highly soluble, and can be washed out easily in cold water.

Four parts of Siltex Gum, Superconcentrated, do the work of five parts of ordinary gum.

If you want whiter whites and brighter, clearer colors, sharply and evenly defined, give Siltex Gum a thorough tryout.

If Shortages Hit You . . .

There may not be any serious shortages of natural oils and finishing materials, but some kind of lean supply in these products seems possible. Remember that for many years Onyx has been duplicating hands and finishes with synthetic products which were normally obtained from natural materials. For example, the Onyxsans have been providing a wider range of hands for cotton, rayon, acetate and bemberg than any natural oils could give, with the added advantage of permanence of finish. A shortage of natural glues and gelatines can be met with the Xyno Resins to get a wide range of finishing effects, in many ways superior to those of the natural products.

Shortages of natural oils and finishes may not be as unpleasant as it may seem on first thought. You may well discover, as many other mills did during the last war, that synthetic products can do a much better job for you cost-wise, as well as quality-wise. We can recommend the materials that will give you the hands and finishes you want.

For One-Bath Desizing

Occonaze LH is a proteolytic and amylotic enzyme in a buffered, stabilized formula, supplied in powder form. High bath temperatures can be used to speed up the desizing operation materially, because Occonaze LH offers the highest available degree of heat stability. It is particularly adapted to continuous desizing, but on either batch or continuous work, you will get clean results, without streaking or blemishes.

onyx

ONYX OIL & CHEMICAL COMPANY, TEXTILE DIVISION

190 WARREN ST., JERSEY CITY 2, N. J.

CHICAGO • BOSTON • CHARLOTTE • ATLANTA

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Photograph courtesy Celanese Corporation of America. Yarn content: Warp — Celanese acetate rayon dull filament; Filling—Celanese acetate rayon bright staple.

A DURABLE GAS-FADING INHIBITOR

ARIPERM P M

Gives fabrics composed partially or wholly of

Acetate Rayon

— lasting protection against fading from atmospheric gases

— with excellent resistance to *WASHING AND DRY CLEANING*

Recommended for dyeing Light Shades, Pastels & Tints as well as medium and heavy shades.

With Ariperm P M there is no appreciable yellowing effect on white goods when exposed in the gas chamber—relatively little effect on light fastness of the color.

Simple application in scouring or directly in the dye bath.

Write for Technical Service Bulletin #201-121.1

Arkansas Co. INC.

NEWARK, NEW JERSEY

RHOZYME LA

LIQUID DESIZING AGENT

Stable in storage — Speeds Desizing — Solubilizes Starches in Minutes

Liquid form easy to handle — Can't harm cloth as acids do

No close control needed — Gives soft, mellow hand

Works safely at high temperatures

PASSES EVERY DESIZING TEST!

Be wise and thrifty.
Write today for full details of this low-cost, highly efficient new enzyme desizing agent... RHOZYME LA.

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Sulfides To Your Schedule...

One of the important reasons for the popularity of Hooker as a basic source for Sulfides lies in the Hooker scheduling and delivery policy.

Much time and thought has been given to shipping, and this planning combined with Hooker's location at one of the important rail centers of the nation, enables Hooker to deliver—on schedule—as promised. This permits you to keep your inventory investment to the minimum while at the same time our ample stocks enable you to meet additional requirements without any difficulty.

All Hooker products are noted for their purity and Sulfides are no exception. Sodium Sulfide (Fe 8 ppm Max.), and Sodium Sulfhydrate (Fe 5 ppm Max.) are of uniform quality that eliminates costly variations in quality of the finished product. There are also added savings due to the rapid and complete solubility of these high purity Sulfides. The clean solution can be used without settling or decanting—a worthwhile time saver.

A request on your company letter head will bring samples and Technical Data Sheets.

SODIUM SULFIDE—Na_2S

Mol. Wt. 78.1
M.P. ..... 100°C

Light buff colored solid in flake form. Rapidly soluble in water; slightly soluble in alcohol; insoluble in ether. Also available in solid form.

Analysis

Na_2S	60 to 62%
NaCl	1.5% Max.
Other Na Salts	2.0% Max.
Fe	8 ppm Max.
Cu, Ni, Cr, Mn, Pb	1 ppm Max.
Water of crystallization	35% Min.

Uses

In manufacture of dyestuffs, chemical intermediates, paper pulp, soap and rubber, as an ingredient of dye liquor for textile dyeing; boiling out linen; ore flotation and metal refining; in unhairing hides and wool pulling; desulfurizing viscose rayon.

SHIPPING CONTAINERS

Flake: Steel drums ..... 90 & 350 lbs. net
Solid: Steel drums ..... 625 lbs. net

SODIUM SULFHYDRATE—NaSH

(sodium hydrosulfide)

Mol. Wt. 56.1
M.P. ..... 55°C

Light lemon colored solid in flake form. Completely and rapidly soluble in water, alcohol and ether.

Analysis

NaSH	70 to 72%
Na_2S	2.5% Max.
NaCl	0.8% Max.
Na_2SO_3 and $NaHCO_3$	0.4% Max.
Fe	5 ppm Max.
Cu, Ni, Cr, Mn, Pb	1 ppm Max.
Water of crystallization	28 to 26%

Uses

In preparation of dyestuffs and other organic chemicals such as thioamides, thiourea, thioglycolic acid, thio- and dithio-benzoic acids, sodium thiosulfate; in unhairing hides, in desulfurizing viscose rayon.

SHIPPING CONTAINERS

Lacquer-lined steel drums .. 90, 350 lbs. net

From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

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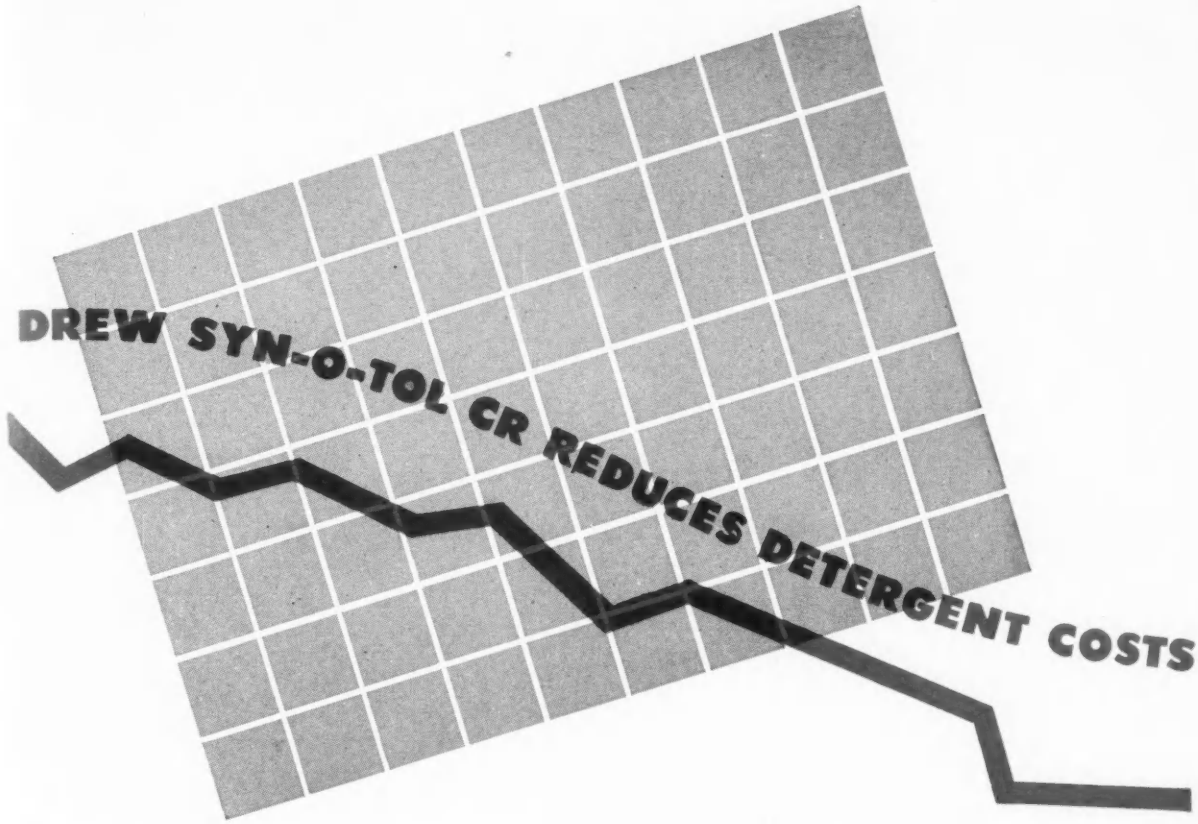
BENZOIC ACID • CHLOROTOLUENE • SODIUM BENZOATE • CAUSTIC SODA • MURIATIC ACID • PARADICHLOROBENZENE • CHLORINE



SYN-O-TOL CR is a combination nonionic-anionic detergent, wetting agent and penetrant that combines the advantages of high concentration with ease of handling. It is highly effective in removing sizing material, oil, dirt, etc. It is excellent for use after enzyme desizing . . . a perfect preparation for dyeing. When used in boil-off, it insures maximum whiteness of fabric, freedom from impurities and high absorbency. It makes an ideal "soaping" agent for washing prints . . . will not cause bleeding . . . will not leave goods harsh or wiry.

SYN-O-TOL CR contains less than 5% of moisture. Its viscous "soapy" stock solutions at approximately 20% concentration, are a big factor in the reduction of waste.

Cut your detergent costs with SYN-O-TOL CR—Prepare 20% active material by mixing with water in your own plant.

Write for technical data today!

RAYONS—Scours out sizing material, oil, dirt, etc.

COTTONS—Insures maximum whiteness of fibre, freedom from impurities, high absorbency when used in kier or open boil.

DYEING—A perfect preparation for dyeing all fibres.

PRINTS—Efficient "soaping" agent for washing prints. Excellent suspending power. Removes printing vehicle . . . leaves grounds white . . . eliminates bleeding of design.

WOOL—Possesses all the useful properties of soap without its disadvantages. Ideal for raw grease wool, yarns and piece goods.

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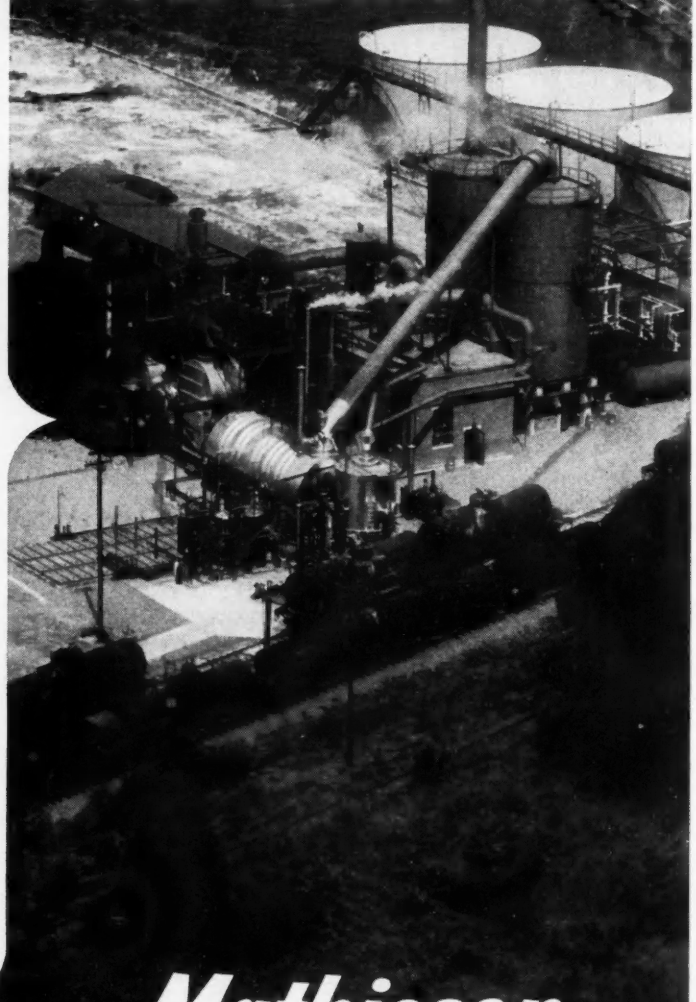
3 Points that favor using MATHIESON SULPHURIC ACID



1 **UNIFORMLY HIGH PURITY**—Mathieson Sulphuric Acid is clear, colorless and free from such impurities as arsenic, selenium and tellurium because it is made exclusively from pure elemental sulphur in modern equipment.

2 **FULL SELECTION OF GRADES**—Mathieson Sulphuric Acid is available in all commercial grades, ranging from 60° Bé. to oleum, 20%.

3 **BULK SHIPMENTS**—Mathieson Sulphuric Acid is available in tank trucks, tank transports, tank cars and tank barges from Baltimore, Md.; and in tank cars from North Little Rock, Ark.; Shreveport, La.; Beaumont, Port Arthur and Pasadena, Tex.

Mathieson—with its great manufacturing facilities including two of the largest sulphuric acid units in the world—makes not only sulphuric acid but most of the other basic chemicals and many of their derivatives. Be sure to consult Mathieson in planning for your future supply of basic chemicals. Mathieson Chemical Corporation, Mathieson Building, Baltimore 3, Md.

Mathieson CHEMICALS

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use **BECCO**

PEROXYGEN compounds

••• You can get whiter, brighter goods at lower cost with BECCO Continuous Hydrogen Peroxide Bleaching. This flexible process, using J-Boxes, couples the efficiency of a continuous flow of goods with the lower overall cost of a BECCO Hydrogen Peroxide bleach. Hydrogen Peroxide 35% and 50% are *safe* bleaches; their mildly alkaline solutions of active oxygen give a highly effective bleaching action. Compared to the batch method, you save on chemicals, steam and overhead.

Hydrogen Peroxide safely and effectively oxidizes vat dyes on all fibers. Easily added to the bath, it rinses freely, leaving no residue.

Other BECCO Peroxygen chemicals for specialized bleaching processes include Peracetic Acid 40% for alkali-sensitive fibers, Sodium Carbonate Peroxide and Sodium Pyrophosphate Peroxide . . . doubly useful as alkaline bleaching agents and detergents.

It will pay you to discuss your bleaching operations with a BECCO representative, a specialist in continuous peroxide bleaching and in the treatment of textiles with active peroxygen compounds. For further information, use the convenient coupon below.

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Twice a year fashion dictates a change in hosiery colors. Transgo, Fancourt's special formula transfer remover, will help you meet this change and beat competition. Transgo is sure . . . fast . . . and will not affect any of the properties of the goods. With Transgo, hosiery is easily processed for redyeing and obsolete stock is profitably turned into the fashion hues of the day.

Transgo is just one of the many Fancourt products that have been tested and proved by leading mills throughout the country. Wire, write or phone today for complete details—Your Fancourt fieldman has the answer to your finishing problems.

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WHY ALGOSOLS

AN EASY ROAD TO VAT FASTNESS

ALGOSOLS are water soluble esters of vat dyes. They produce the same brilliant shades and have the same fastness properties as the parent vat dyestuffs from which they are derived. On cotton and rayon they are more level dyeing and have better penetration than ordinary vats. Prints are smoother and clearer than normally applied vat dyestuffs. On wool Algosols have superior light and wash fastness without impairment to the quality of the wool. The method of applying Algosols is simple and inexpensive.

COTTON

Mercerized cotton piece goods of constructions otherwise difficult to color, have outstanding smoothness and penetration when dyed with Algosols. The shades of colored yarns used for cross-dyed effects in striped shirtings, etc. are not affected when over-dyed with Algosols. Mercerized and other types of cotton yarn dyed in package dyeing equipment are uniform, evenly colored from outside to center and free from crossovers.

WOOL

Suitings dyed with Algosols have excellent fastness properties even in light shades. Blankets and knitting yarns have outstanding fastness to light and washing. Algosols are recommended for dyeing slubbing and yarns in circulating machines. Shrink-proofed wool dyed with Algosols has excellent fastness to light and repeated washings. Wool can be dyed with Algosols without impairment to the quality of the wool.

RAYON

Rayon piece goods composed of filament, spun rayon or filament-spun rayon yarn when dyed by the continuous method or on the jig have solid, clear shades and excellent fastness. Rayon skeins are easily dyed on the 'Cascade' type machine. Algosols are excellently suited for dyeing packages and cakes in pressure dyeing equipment.

PRINTING

In roller, screen and resist printing prints are smoother and colors clearer than the normally applied vat dyestuffs from which they are derived. Algosols have excellent light and wash fastness and do not crock. Blotch printed drapery fabrics have smooth grounds with excellent fastness to light and washing. Algosols are ideal companion colors for Rapidogens and Fast Color Salts.

MIXED FIBERS

Suitings and dress goods of spun rayon and wool blends dyed in solid shades meet all fastness requirements. Special effects can be obtained on cotton-wool and rayon-wool mixtures by dyeing the wool and leaving the cellulosic fibers undyed or on viscose-acetate blends the viscose can be dyed fast color and the acetate tinted to yield two-tone effects.

COST

The simplicity of application, saving in time, lower cost of chemicals, superior dyeing and printing results offset any increase in dye cost over ordinary vats in light and medium shades. Not infrequently Algosols prove cheaper in light shades.

✓ **DELIVERIES** To insure prompt deliveries stocks are carried in warehouses strategically located throughout the country.

Technical information, product samples and the service of a highly trained technical staff are yours for the asking.

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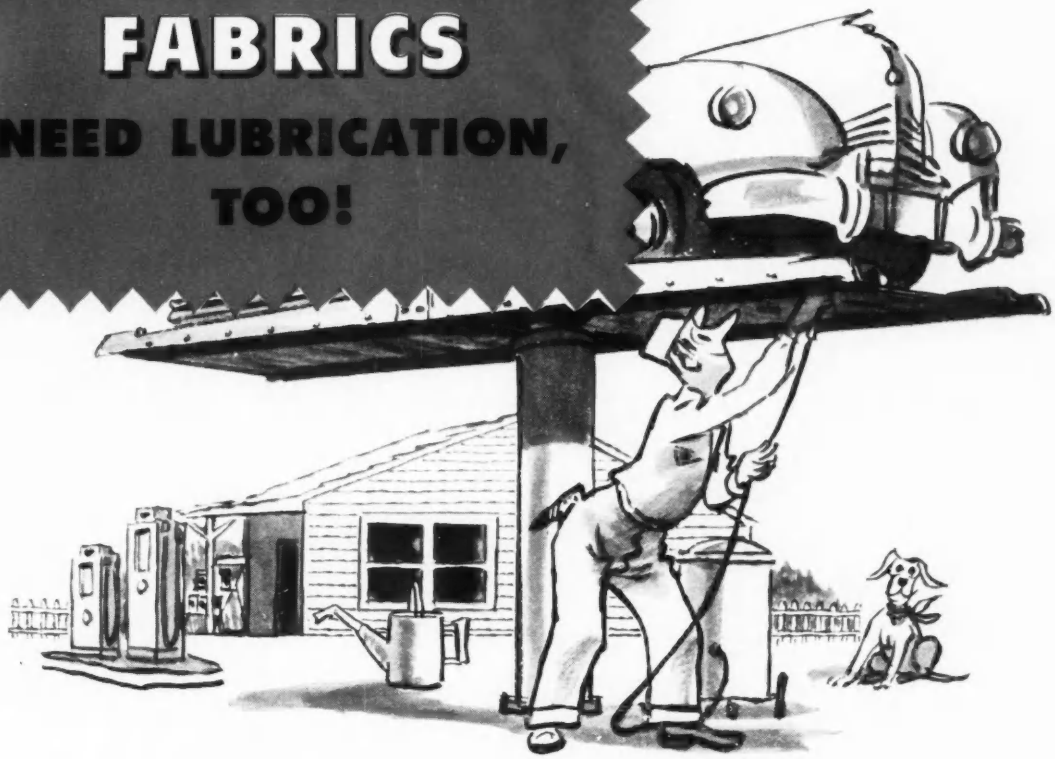
FABRICS
NEED LUBRICATION, TOO!



Quality cottons and synthetics mean smoother, softer fabrics —and that means fabrics treated with "Avitone" fiber softener. "Avitone" protects fabrics too—against the cutting or breaking of yarn during high-speed sewing operations. The needle slides easily between the lubricated fibers. Use "Avitone" to make fabrics easier to work with—and to keep them lovely even during storage!

EASY TO USE: "Avitone" is stable to hard water, and doesn't turn rancid or discolor on aging. And "Avitone" aids shrinking processes with its wetting action.

Look into "Avitone" today. For further information, check with Fine Chemicals Division, E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Delaware. Branch offices: Atlanta, Boston, Charlotte, Chicago, New York, Philadelphia. Providence, San Francisco.

AVITONE
TRADE MARK
Fiber Softener

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Cotton and the ULTRAWETS

From raw cotton to finished fabric . . . much of the processing involved can be improved by using the ULTRAWETS—a family of alkyl aryl sulfonates tailor-made for particular jobs. For example:

In soaping off after dyeing and printing: Liquid ULTRAWET 35KX is the most economical alkyl aryl sulfonate for volume use. Flake ULTRAWET K or bead ULTRAWET SK where dried products are desired.

In dyeing and printing: The liquids ULTRAWET 30E and ULTRAWET 30DS are particularly efficient as dye leveling and penetrating agents.

In kier boiling: Liquid ULTRAWET 35KX has excellent penetrating, emulsifying and detergent properties to help remove the natural waxes, pectin and soil from the cotton.

Cotton is just one of the textile fibers with which the ULTRAWETS are being used. They are equally important in the processing of wool and synthetic fibers. We will be glad to send you a brochure which will give you facts about the whole ULTRAWET family—liquids, flakes and beads. The Atlantic Refining Company, Chemical Products Section, 260 S. Broad St., Philadelphia 1, Pa.

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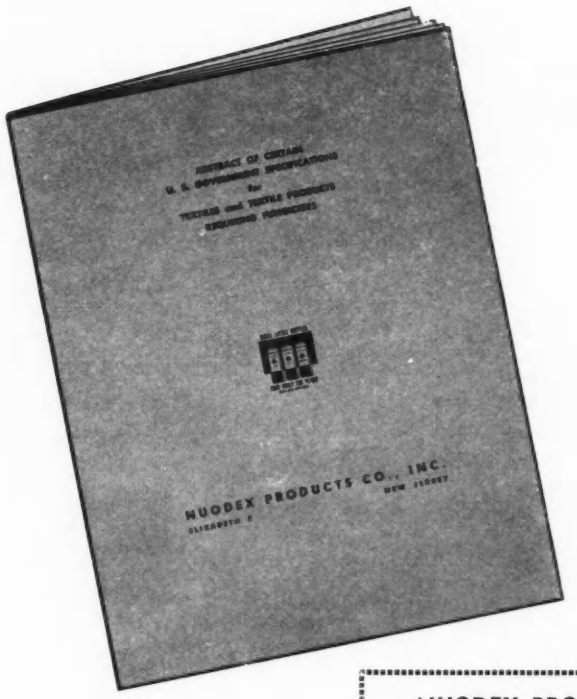
GUIDE TO GOVERNMENT SPECIFICATIONS FOR FUNGICIDE TREATMENT OF TEXTILES



FREE—this new compilation of U. S. Army, Navy, Air Force, Coast Guard and Federal specifications for the fungicide treatment of textiles. Tells you at a glance the individual specification number and title together with the required concentration of the applicable Nuodex fungicide.

This latest abstract of U. S. Government specifications for textiles and textile products requiring fungicides covers over 80 individual items which comprise the bulk of current government textile procurement. It belongs on the desk of every textile manufacturer and finisher.

To get your free copy, fill out and mail the coupon below—today.

Send for Your Complimentary Copy TO-DAY

NUODEX PRODUCTS CO., INC.
Elizabeth F, New Jersey

Gentlemen:

Please send my complimentary copy of your new Government Specifications for Textiles at once.

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THREE LITTLE BOTTLES

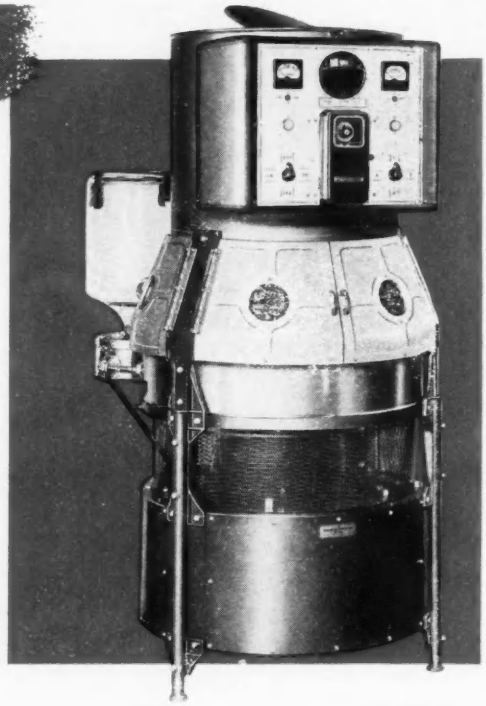
THAT BUILT THE PLANT

REG. U.S. PAT. OFF.

NUODEX PRODUCTS CO., INC.

ELIZABETH F, NEW JERSEY

THE FADE-OMETER



The Atlas Fade-Ometer, fast becoming accepted as a yardstick for standardization in many fields, is a practical laboratory machine that makes possible the accurate determination of the destructive effects of sunlight on any material or type of finish in a fraction of the time required by exposure to actual sunlight. Utilizing new calibration paper, the degree of fading on each sample can be measured in terms of Standard Fading Hours.

In making tests, samples in masked holders are rotated around the Enclosed Violet Carbon Arc — the closest approach to natural sunlight — and humidity is regulated according to the specific requirements of each test. To assure equal distribution of light to each sample, specimens travel around the source of radiation at a fixed distance from it and at constant speed. At the same time, temperature within the cabinet is controlled to within ± 3° F.

Operation of the Fade-Ometer is fully automatic, and is regulated by the simple but complete control panel which includes voltmeter and ammeter, a four point switch to correct minor variations of arc intensity, main line switch, pilot lights, thermoregulator, and cycle timer unit. This serves to keep all variable factors — time, temperature, humidity, and light — under accurate control. Any interruptions of electric service are also recorded.

The Fade-Ometer may safely be left in continuous operation overnight, and requires no attention from the operator other than the replacement of carbons once in 24 hours. It is available for either AC or DC service, and with a wide variety of sample holders and exposure masks.

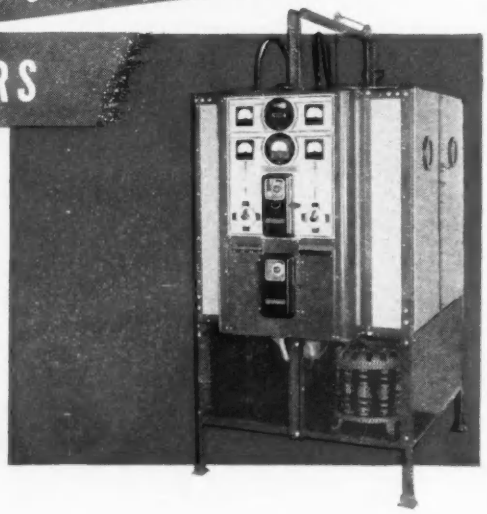
Specimen Suspension

Accuracy of test results in older Fade-Ometer models can be increased by the addition of a lower suspension ring. Specimen holders, designed for use with this lower ring, are held securely at top by the upper ring and at bottom by the lower ring, thus assuring proper vertical alignment and equal distribution of heat and light energy for all samples.

Holders are available in dull finish stainless steel.

For quality control....

The Twin Arc and Sunshine Arc WEATHER-OMETERS

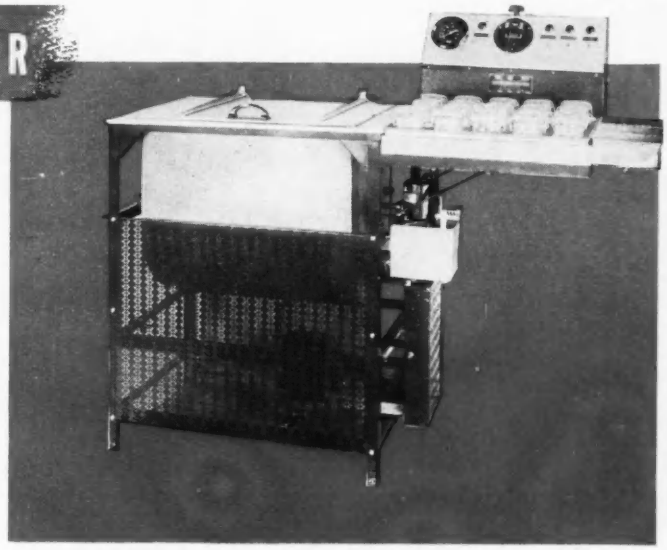


The Weather-Ometer faithfully duplicates the combined weathering of sunlight, rain, heavy dew and thermal shock, and accelerates the deteriorating effects of these conditions so that the equivalent of years of actual outdoor exposure is reproduced in a few days testing in the laboratory.

Completely automatic control of light and water cycles is provided by the Atlas Cycle Timer Unit which can be set to meet requirements of standard and special weathering tests. A direct reading thermo-regulator, automatic shut-off switch and a running time meter are included as standard equipment. After setting exposure cycles by placing the proper cam on the control panel, the Weather-Ometer can safely be left in continuous operation overnight without attention other than the replacement of carbons once in 24 hours.

Weather-Ometers are supplied with either the Enclosed Violet Carbon Arc or the Open Sunshine Carbon Arc as a source of radiation since the carbon arc is recognized as the best available duplicate of Noon June Sunlight.

THE LAUNDER-OMETER



The Launder-Ometer is a scientifically designed and proved instrument, accepted by the A.A.T.C.C. as the standard laboratory washing machine. By duplicating the damaging effects of severe commercial launderings, it serves to test color fastness to soaps and detergents, and resistance to bleeding, shrinking, washing and mechanical action. In addition, it is used for dyeing tests at boiling point.

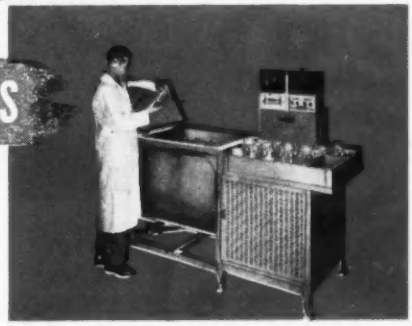
Precision controls in the Launder-Ometer permit careful regulation of all factors, and identical reproduction of tests whenever desired. Standard equipment also includes the Atlas Pre-heating Loading Table, which makes it possible to start all samples at uniform and correct temperature. Mechanical action is provided by the introduction of stainless steel spheres or rubber balls into each container.

A new type control cabinet, housing all switches, pilot lights, indicating and control instruments, and direct reading dial type thermometer, is located directly behind the Pre-heating Loading Table at a height most convenient for the operator. Launder-Ometers are available for use with electricity, steam, gas, or both electricity and steam for heating the water bath. All machines are easily adapted to receive any type of container now under consideration by the A.A.T.C.C.

and research testing

ATLAS-OMETERS

Research Model LAUNDER-OMETERS



The Atlas line now offers two Launder-Ometer models specifically designed for research testing. These machines can accommodate larger samples, and are available with container capacities ranging from 20 pint to 6 half-gallon jars. They are equipped with vari-speed drive units for operation between 15 and 50 r. p. m.

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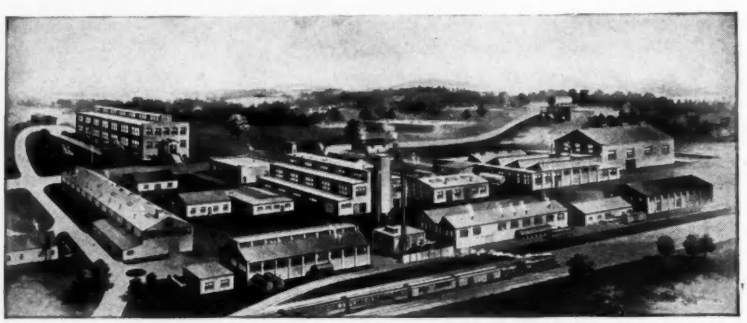

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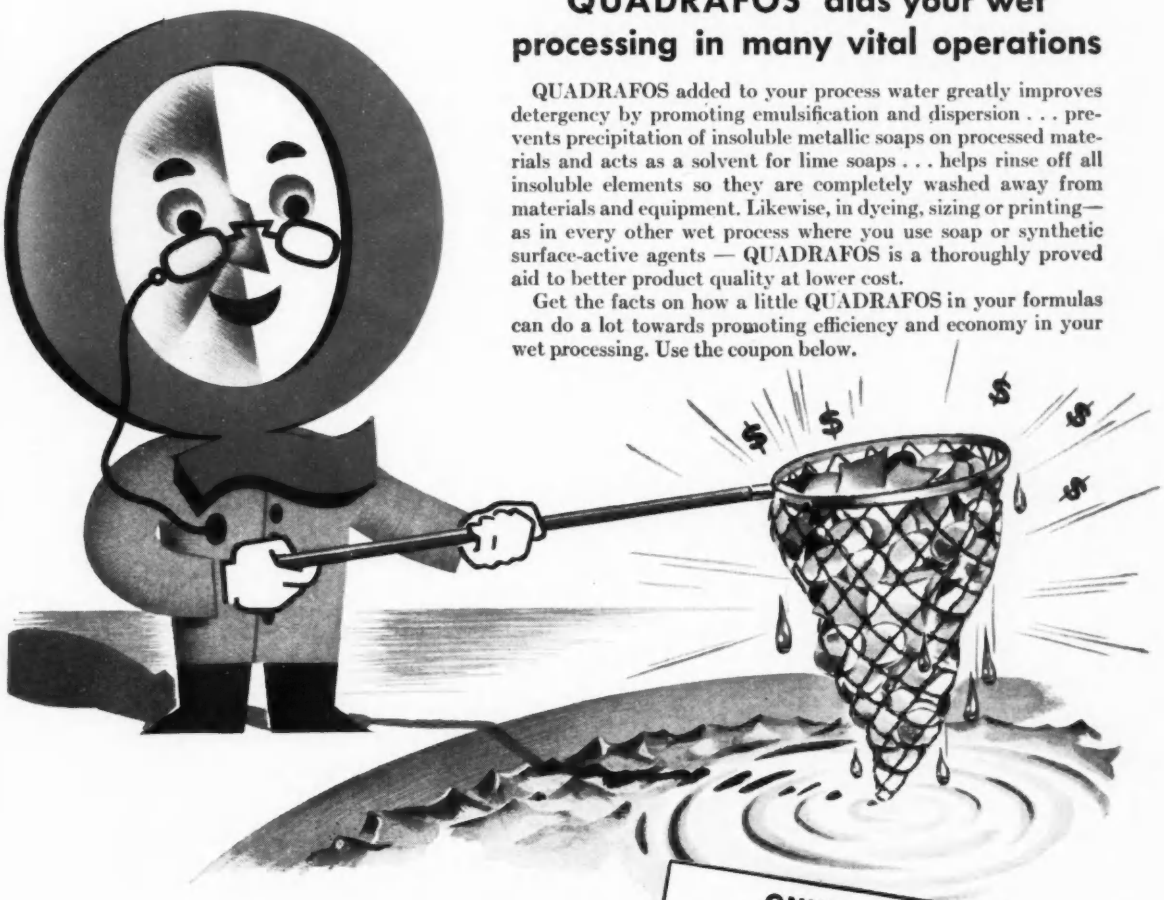

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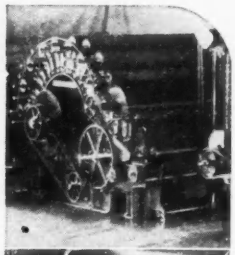

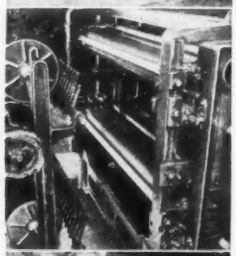

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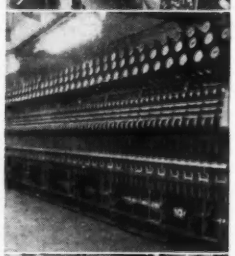

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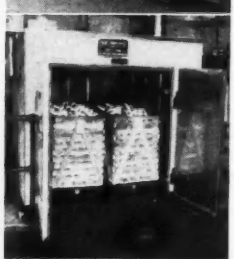
Nopco FUA

- does not set in the yarn after steaming, nor in the fabric when greige goods are crabbed.

Result: No cloudy, shady piece dyeing



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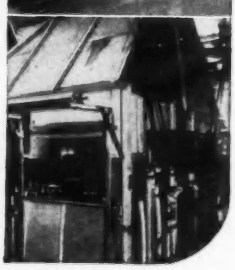

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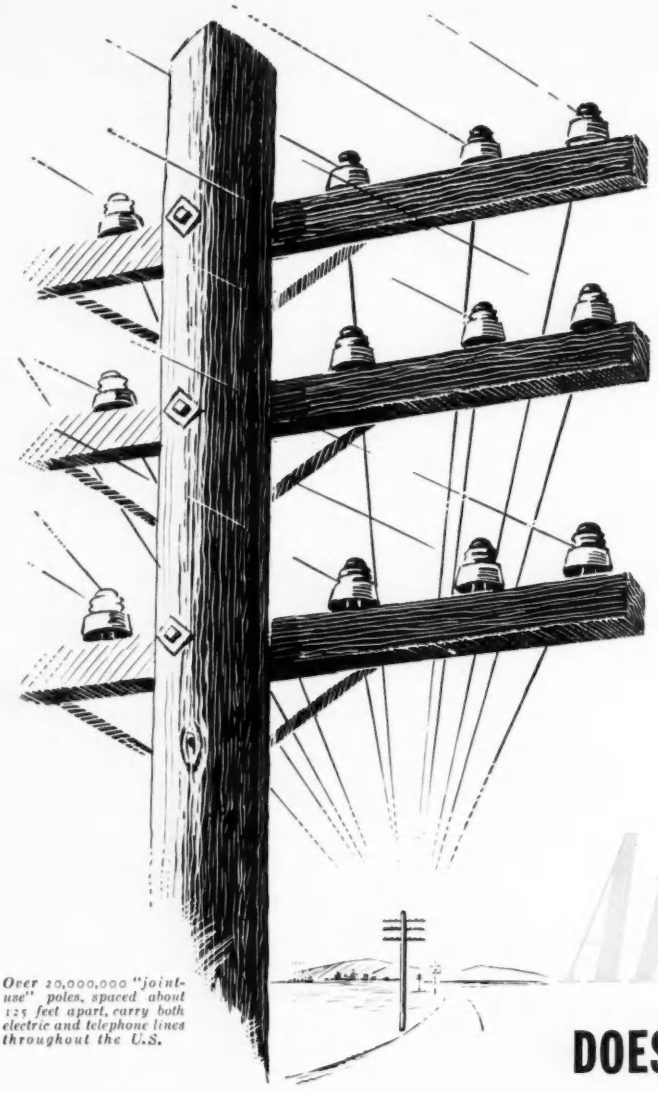

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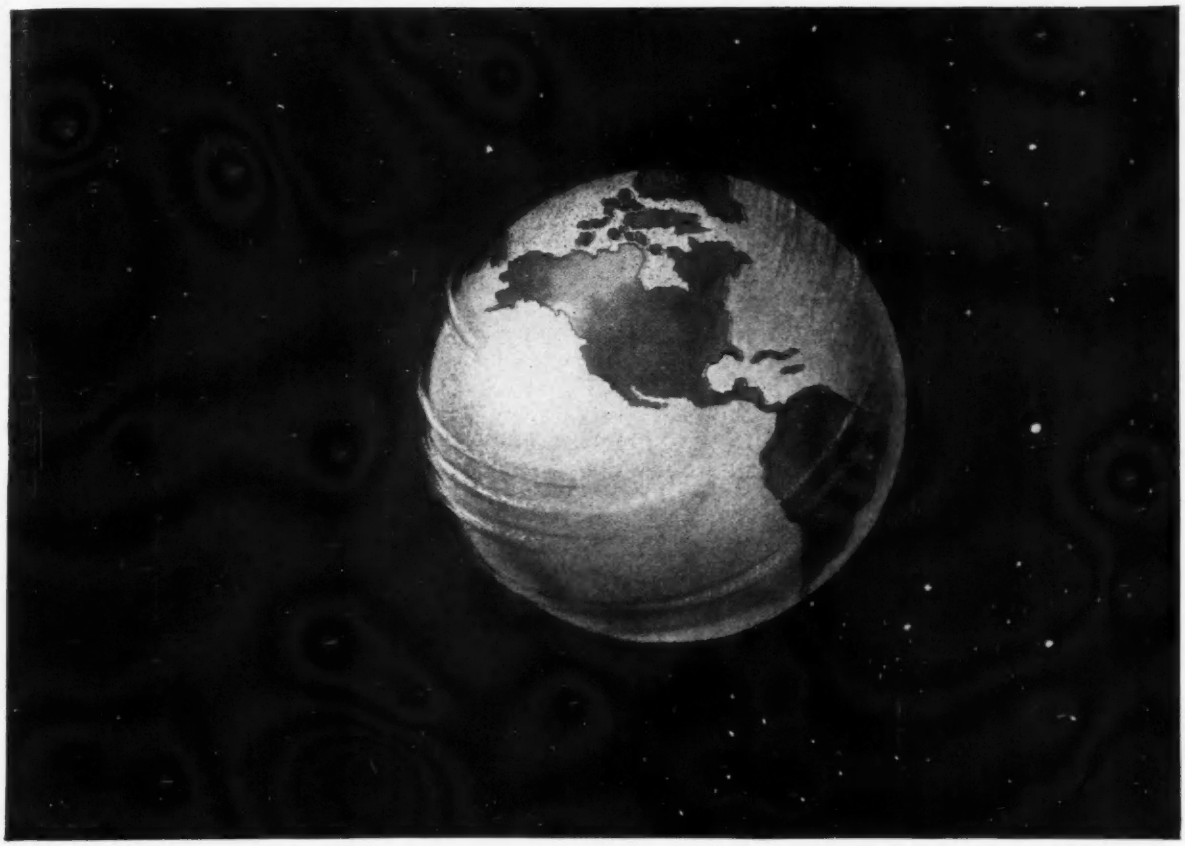

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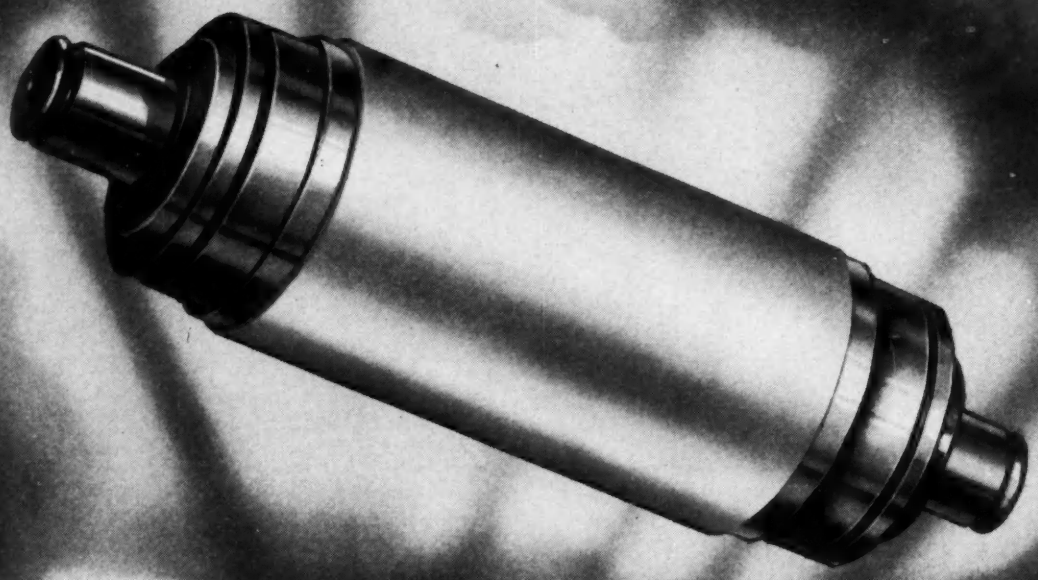

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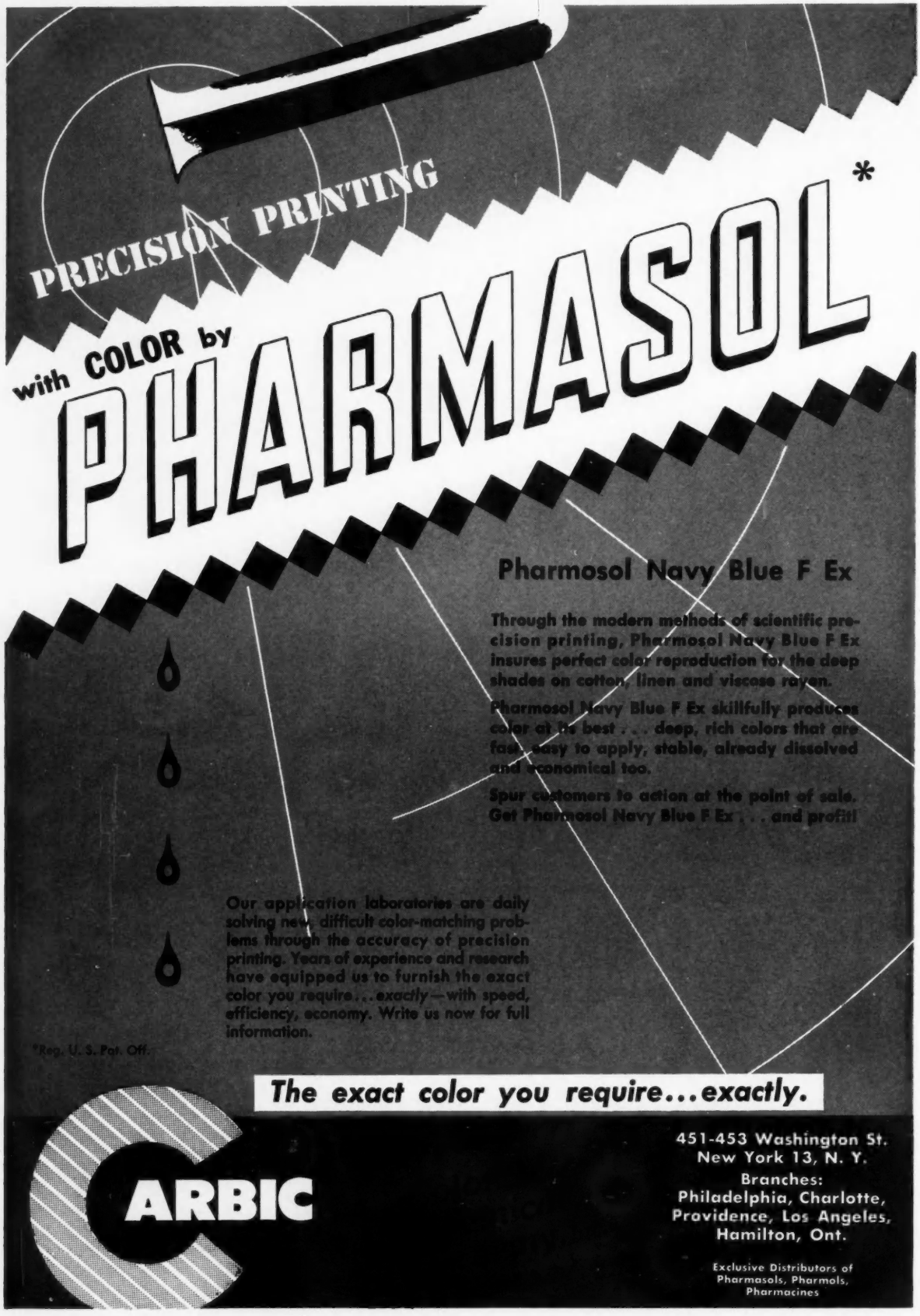
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VOLUME 39 NUMBER 20

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STUDIES ON WOOL DYEING: THE INFLUENCE OF THE CUTICLE IN THE DYEING OF THE WOOL FIBER

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Time-temperature studies of dyeings made under the microscope using dyes, such as Calcocid Alizarine Blue SKY, Calcocid Alizarine Blue SAPG and the cobalt complex of Calcochrome Fast Green SGV, show that scalewise dyeings may be obtained. At first the distal edges are dyed, and then perhaps certain scales are completely dyed. In some instances it was observed that the dyeing was confined to the distal edges along the entire length of the fiber.

These observations of scalewise dyeing suggested that the cuticle might exhibit resistance to peneration by dyes of all types, and that this effect might be observed in general if suitable conditions were chosen in each case. Dyeings were made using Australian fleece and dyes, such as Calcocid Orange Y, Calcocid Fast Light Yellow 3G, Calcocid Eosine G. It was observed that all three of these dyes dyed the tips heavily at low temperatures, and produced tippy effects.

The important influence of the scales on dye penetration was also shown by physical distortion of the fiber. Knots were tied in single fibers of Australian fleece and the dyeing studied under the microscope. It was noticed that the distal edges of the scales on the outer periphery of the loop raised away from the fiber to give a ratchet-like effect. This shows that the scales are free at the distal edges and tend to separate under physical distortion. It was also observed that dye penetration at the distal end of the separated scales was very rapid and that the knot was colored rapidly on both the outer and inner portion, indicating a distortion of the scales at both outer and inner loops of the knot.

A study of the location of chemical modification of the fiber, such as chlorination, also indicated that the distal edges of the scales were the first to be attacked. It is possible to set up experiments in which this chemical attack is confined to the distal edges only and such experiments are described.

INTRODUCTION AND SUMMARY

IN the dyeing of wool the penetration of the dye into the fiber is essential to the full development of shade and fastness. This behavior is governed both by the nature of the dye and by the nature of the fiber itself. Successful practical methods of application must achieve a uniform penetration and distribution of dye throughout the fibers being colored, since solidity of shade is directly dependent upon these factors. Skittery, unlevel and tippy dyeings exemplify lack of uniform penetration and distribution of dyestuff. Insufficient fiber penetration is also one of the chief causes of inferior fastness to crocking and to wet-finishing operations.

Numerous references to the structure and chemical composition of the wool fiber are found in the literature. An excellent review of the present knowledge of its physical structure appeared recently *(1)*, dealing with both optical- and electron-microscopic studies. It has been shown that the wool fiber consists of a complex surface component called the cuticle, and a complex inner structure called the cortex. The submicroscopic, or fine structure of both components has been studied by various investigators *(2, 3, 4, 5, 6, 15)*. The cuticle is believed to consist of a smooth, uniform outer layer, known as the exocuticle. Beneath the exocuticle lies a second layer, the endocuticle, which is pitted and ridged longitudinally. In addition a very thin membrane, the epicuticle *(4)* has been found overlying the surface of the exocuticle. The epicuticle exhibits chemical resistance and properties differing from both of the underlying layers, and was predicted by Whewell and Woods *(16)*. It has been studied intensively quite recently *(15)*.

Within the cuticle lies the cortex, which consists of cortical cells placed longitudinally. The cells also exhibit a fibrillar structure of considerable complexity, the ultimate component of which may be the keratin molecule itself, bound together in longitudinal "protofibrils" which in large numbers build up the larger units, or fibrils, of the cortical cells.

When examined with the optical microscope, the macro structure of the cuticle presents the characteristic scaly external appearance of the wool fiber. The scales appear to overlap one another in the manner of shingles on a roof, and are believed to have a wedgelike form, decreasing in thickness toward the proximal (inner) end. Successive scales along the fiber are relatively free from each other toward their distal or outer ends. The surface characteristics of this structure are generally considered to be involved in the property of felting, which is dependent upon the ability of the wool fiber to travel in the direction of its root end when fulled or milled. Electron and optical microscopy has provided some evidence that the fringes or edges of the scales are responsible for this property since certain

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treatments which reduce the felting power of wool appear to remove or modify the behavior of this portion of the cuticle scale *(17)*. The rate and degree of penetration of dyes are influenced by the character of both cuticle and cortex, as well as of the dye itself.

Our experiments have shown that those dyes which penetrate the cuticle readily under suitable normal dyeing conditions produce dyeings of maximum fiber uniformity. Other dyes that exhibit only slight ability to penetrate the cuticle at temperatures below 180° F. are able to enter the fiber through natural or artificial breaks in the outer sheath, and then may diffuse with comparative ease through the cortex. Certain dyes show only slight tendency, even at boiling temperature, to penetrate the cuticle or to diffuse through the cortex, and comprise those types which are most liable to produce unlevel dyeings. Frequently, extended time at the boil may compensate for slow rates of penetration and diffusion and thus provide dyeings of practical uniformity. Chemical modification, such as chlorination, in which the properties of the cuticle are altered, results in decreased resistance to penetration of all types of dyes and consequently in a greater degree of levelness. It has also been shown *(7)* that the degradation of the cuticle in areas of the fiber damaged by sunlight and weathering permits rapid penetration by dyes not otherwise able to enter the fiber, an effect well known in tippy-dyeing wools. Salts of chromium and other metals have been found to behave in a manner similar to dyestuffs insofar as their penetration into the wool fiber is concerned.

Figure 1
Wool fiber showing distal ends of scales heavily dyed. 4% cobalt complex of Calcochrome Fast Green SGV.

FIBER-SURFACE DAMAGE, DISTORTION AND INCISIONS

In the present investigation an attempt has been made to study the dependence of dye penetration upon physical factors, such as fiber distortion, natural degradation and incisions or mechanical damage to the cuticle. The penetration of dyes into cut ends and crushed areas of fibers has been observed previously *(7)*. This earlier work has now been extended to include many dyes applied by a variety of methods. The progress of penetration through such physical defects has also been observed in detail. It was further believed that physical distortion, such as in knotted fibers, would produce changed rates of penetration of dyes. This belief has been substantiated.

When wool is dyed with acid dyes, penetration and levelness of shade are dependent upon the time of dyeing at or near the boil. Time-temperature studies made under the microscope on the absorption and penetration of dyes, such as Calcocid Alizarine Blue SAPG (C.I. 1054), Calcocid Alizarine Blue SKY (C.I. 1088), Calcomine Scarlet B (C.I. 382), and the cobalt complex of Calcochrome Fast Green SGV (C.I. 292) have revealed the behavior of these dyes during the dyeing cycle.

Two percent of Calcocid Alizarine Blue SAPG was applied to Australian fleece wool* with 8% anhydrous Glauber's salt and 3% sulfuric acid. Groups of fibers removed at various times and temperatures during the dyeing and then examined longitudinally under the microscope, exhibited a large number of extremely local areas of penetration of dye before the dyeing reached 180° F. At this temperature, areas of local penetration of dye were numerous with considerable absorption and development of color. The colored areas were not confined to the tip but were located at irregular intervals along the entire length of the fiber. At 200° F. the coloration of these areas was much more pronounced and the areas of local penetration were of greater extent. With increasing length of time at the boil, the contrast between heavily dyed and lightly dyed areas became less distinct, though this contrast was still apparent after boiling 35 minutes. After 1 hour at the boil, very little variation in shade remained in the fiber. When viewed in bulk, the dyeing was very level and solid.

Similarly, two percent dyeings of Calcocid Alizarine Blue SKY were studied in detail and found to give approximately the same effect; however, one important difference was noted. The local variations observed with Blue SKY were very much smaller in area, and at 170° F. were actually confined to the edges of the scales along the entire length of the fiber. In these scale-wise variations, the color was concentrated at the distal edges of the scales. At 180° F. the variations had increased in intensity indicating further deposition and penetration of color. When the dyeing reached 200° F., leveling and diffusion were taking place rapidly, and the extreme local dyeing aspect had changed to a more continuous coloration. At the boil the fibers were generally uniform in shade and quite level throughout their length.

Calcocid Indo Blue G (Pr. 223), dyed with 6% ammonium sulfate and studied in a similar manner, showed definite distal-edge dyeing and other scale variations at 155° F. At 180° F. certain scales were

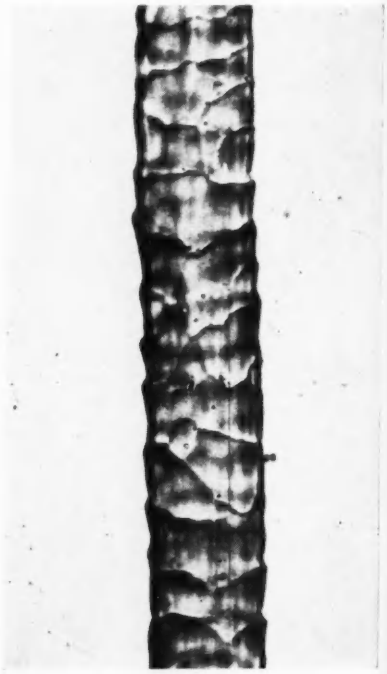

Figure 2
Wool fiber showing distal-end dyeing. 4% cobalt complex of Calcochrome Fast Green SGV.

* The wool used throughout this investigation was taken from an Australian merino fleece as sheared from the sheep. Staples were prepared for dyeing by repeated extraction with neutral carbon tetrachloride, followed by several rinses in warm distilled water.

either fully dyed or partially colored rather heavily while adjoining scales remained undyed. In contrast to the behavior of the Blue SAPG and Blue SKY, the Indo Blue G dyeing was not level at the boil and exhibited scalewise variations even after boiling for 15 minutes.

Two percent dyeings of a cobalt complex of Calcochrome Fast Green SGV applied with 10% anhydrous Glauber's salt and 3% ammonium sulfate produced the best examples of scalewise coloration of any dye examined. The fibers exhibited no definite coloration of the scales after boiling 15 minutes. Three percent acetic acid 28% was then added to the boiling dye bath and after 7 minutes additional boiling, definite scale dyeing was observed. These scalewise effects were extremely sharp and involved only the distal edges of individual scales (Figure 1). With the passage of time at the boil, the coloration spread from the distal edge toward the base of the scale. After dyeing at the boil for 30 minutes, fringe-dyed scales could be observed irregularly along the entire length of the fiber (Figure 2). In some cases whole scales became colored but were surrounded by other scales, which remained undyed (Figure 3).

These observations of scalewise dyeing suggested that the cuticle might exhibit resistance to penetration by dyes of all types and that this effect might be observed in general if suitable conditions were chosen in each case. A series of experiments was therefore carried out in which dyeings were made by customary procedure with a wide range of types of dyes. The difference in depth of shade between the tip and body of the fiber was observed continuously during each dyeing. In every case tippy dyeing was observed during the early stage of the dyeing cycle. Significantly included among the dyes exhibiting this effect was Calcocid Orange Y, a well-known level-dyeing type, with which extremely tippy dyeings were obtained in the neighborhood of 130° F.—160° F. Two other well-known level-dyeing types yielding tippy dyeings at temperatures of 150° F. or lower are Calcocid Fast Light Yellow 3G, (C.I. 636), and Calcocid Eosine G, (C.I. 114). It should be emphasized that these dyes are among the most level-dyeing types, owing to their ability to diffuse readily through the cuticle at elevated temperatures. Any division of dyes into classes based upon apparent ability to penetrate the fiber is essentially a matter of the rate at which this penetration of the cuticle can occur at a given temperature.

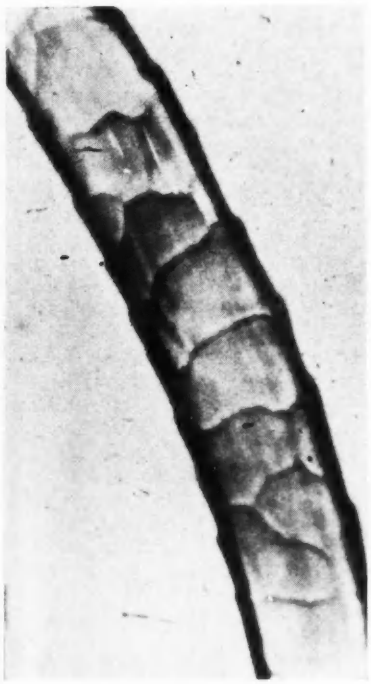

Figure 3

Wool fiber showing local scale dyeing. Dyed with 4% cobalt complex of Calcochrome Fast Green SGV. The dark lines bordering the fiber should be disregarded.

Dyeing effects observed in these dyeings indicate the important role of scale structure in controlling the penetration and diffusion of certain dyes into the fiber. The initial entry of dye at the edges of the scales and in some instances the rather sharply defined partial or complete coloration of scales can be explained by the existence of a surface layer which is capable of resisting penetration by the dye. Partial dyeing of a single scale would then be expected to occur wherever this surface membrane was damaged or removed prior to dyeing, or weakened or ruptured during the dyeing process. The existence of such a membrane or skin has been suggested by several investigators *(16, 17, 18, 19, 11, 21, 8, 15)*. This layer is now generally considered to be the epicuticle of the fiber. Because of the correlation between local or scalewise dyeing and the heatheriness or skitteriness of the shade when viewed en masse, emphasis should be placed on maintaining a dyeing at the boil until the dyes have penetrated and diffused as completely as possible into each fiber. When the individual wool fibers are heavily dyed either at the tips or in local areas along their length, maximum development of color value and levelness of shade cannot be obtained.

EFFECT OF PHYSICAL DISTORTION. — The effect of the physical distortion of the wool fiber upon its dyeing properties has been studied with the use of fibers in which simple knots were tied prior to dyeing. With dyes of all types, initial penetration was observed in the knotted portion. Calcocid Alizarine Blue SAPG, Calcocid Milling Red G (C.I. 443) and Calcomine Scarlet B afforded particularly good examples of the influence of this type of distortion. With the Calcocid Alizarine Blue SAPG type in a dyebath containing 10% anhydrous sodium sulfate and 3% sulfuric acid, early and rapid penetration was noted only in the knotted portion of the fiber. At 170° F. the knot was deeply dyed, particularly on the inside of the loop, while the remainder of the fiber exhibited only slight coloration. At the boil the areas of coloration surrounding the knot were much extended in size. After 15 minutes at the boil, the penetration of dye into the fiber as a whole was quite apparent, and after 90 minutes at the boil, an essentially uniform shade was observed throughout its length, including the knotted portion.

The microscopical observation of the knots at successive stages during dyeing revealed an extremely rapid penetration of dyes in regions of both compression and tension, i.e., on both the inner and outer surfaces of the knot loop. Here the scale-ends, as seen in profile on the outer surface, were much more prominent than

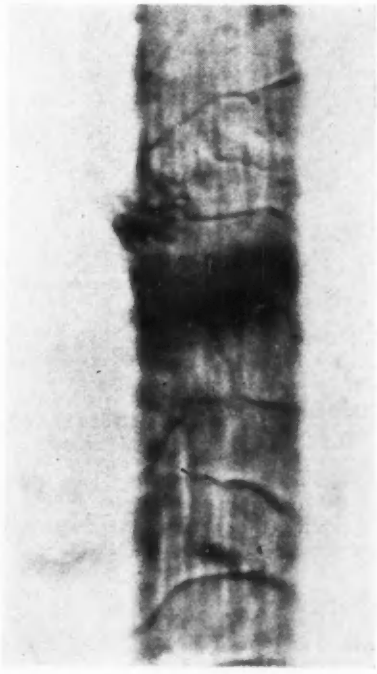

Figure 4

Penetration of Calcomine Scarlet B through incision after boiling 20 minutes.

Figure 5

Part of knot tied in wool fiber showing ratchet-like separation of scales. Note local penetration of dye in upper and lower areas. In the original photographs the appearance of the raised scale nearest the tip end of the fiber suggests the presence of an unbroken film overlying the edge of the scale, which is viewed laterally.

Figure 6

Opposite side of knot shown in Figure 5.

on the straight fiber, and, in a number of cases, the scales were raised in sharp projecting outline, presenting a striking ratchet-like or saw-mesh appearance. (Figures 5-6). These projecting distal ends offer convincing proof of the individuality of the scales. On the inner surface of the loop the scales appeared to be compressed against each other, although the position and condition of each individual scale could not be seen. Distortion either by tension or compression probably results in the rupture of the epicuticle, making possible the separation of the scales and affording easier access of the dye to the inner parts of the fiber. Since the knotted portions of the fiber behaved normally in respect to the leveling of the dyeing during boiling, the effect of distortion is probably limited to the degree of protection provided by the cuticle.

Dyes, such as Calcocid Milling Orange 4R (patented), exhibited similar penetration into fiber knots and displayed no tendency towards uniformity of distribution during continued boiling. As a result, deeply colored knots were readily obtained in fibers which otherwise remained practically undyed. The same contrast was found with dyes that are known to produce positive tippy effects, such as the cobalt complex of Calcochrome Green SGV. In contrast to dyes of the above two types, when Calcocid Orange Y, Calcocid Light Yellow 3G, and Calcocid Eosine G were used, the preferential coloration within the knotted region of the fibers could be detected only by very careful observation.

The same behavior was noted when incisions were made deliberately by cutting part way through the fiber with a razor blade. Penetration was first noted in the incision and was followed by diffusion into the cortex in both directions along the fiber from the incision; otherwise the fiber remained undyed. Similar results were obtained with Red G and Scarlet B types (Figure 4) in dyebaths containing 3% acetic acid, 28%, and 10% Glauber's salt, although Red G and Scarlet B did not level during boiling as well as Blue SAPG. In addition, prominent scalewise dyeing variations were observed with Calcomine Scarlet B dyeings.

As a further example of the ability of the cuticle to resist penetration by certain dyes, sheared Australian fleece wool was dyed for a period of eight hours of continuous boiling with 2% of a metal complex of 1-(4'-sulfophenyl)-3-methyl-5-pyrazolone coupled to diazotized 4-nitro-2-amino-phenol (14), 10% anhydrous Glauber's salt, and 4% acetic acid 28%. Throughout this period, most of the fibers resisted the dye, and only slight coloration was obtained except in the tip region and at the sheared ends. The undyed center portion of the staple was then crushed between two pieces of metal and replaced in the same dyebath at the boil, following a small addition of the same dye and acetic acid, 28%. After 15 minutes of boiling, the staple was again removed, rinsed, dried, and mounted longitudinally for microscopical examination. It was observed that, although the fibers had resisted the penetration of this dye for 8 hours at the boil, mechanical rupture of the scale structure permitted the dye to penetrate rapidly during the further 15-minute interval. Wherever the scale structure remained intact, however, little if any further penetration of dye was obtained. A second staple, similarly dyed for 8 hours, was allowed to remain in the boiling dyebath while an addition of a small quantity of Calcocid Orange Y Conc. was made. Within one minute all parts of the staple were uniformly penetrated by the Orange Y Conc. Complete penetration of the Orange Y was confirmed by the examination of cross sections of fibers taken at intervals along the length of the staple.

Further confirmation of the influence of scales on dye penetration was obtained in the dyeing of fibers exhibiting natural irregularities in which the normal scale sequence was interrupted. An extended series of dyeings was made with combinations of acid and metallized dyes, typical of which is the combination of 1% Calcofast Wool Bordeaux BN, 0.25% Calcofast Wool Violet 6R, and 0.5% Calcocid Orange Y Ex. Conc. When combinations of this type were dyed with 8% anhydrous Glauber's salt and 3% acetic acid, 28%, it was found that the natural irregularities, the mechanically crushed, and the incised areas were deeply dyed with the metallized types in the same manner as the tip portion damaged by weathering agencies. The normal portion of the fiber was colored only by the acid dye, which was selected to dye both damaged and undamaged areas equally without regard to scale structure.

It will be apparent from these experiments that a wide variation in the effect of scale structure upon the penetration and leveling of dyes is observed among dyes of the acid and metallized types. In a first group represented by Calcocid Orange Y and usually applied in acid solutions, dependence upon scale structure is observed only at temperatures well below 212°F. At temperatures approaching the boil, no evidence can be seen of irregular penetration by these dyes, and dye absorption proceeds uniformly throughout the dyeing process in both normal and damaged portions of the fiber. In a second group, represented by Calcocid Alizarine Blue SAPG, the entry of dye takes place through surface defects during the early stages of dyeing, and is followed at the boil by the diffusion of dye into the cortex during the boiling period, resulting in a uniformly colored fiber. A third group is typified by Calcocid Milling Orange 4R, with which penetration is also observed primarily at points of rupture in the cuticle, whether due to natural or artificial causes. Little or no tendency to penetrate the cuticle and migrate into the cortex substance is observed with this type of dye, and level dyeings of individual fibers are not obtained even after prolonged boiling.

Two properties of penetration and dif-

fusion appear to be involved, the first with reference to the cuticle, the second with reference to the cortex. A given dye may exhibit high or low ability to penetrate either or both the cuticle and cortex. These observations apply equally well to chromable and premetallized types. With the experimental equipment available, measurements of rates of diffusion through cuticle and cortex could not be carried out. Such measurements would undoubtedly further clarify the factors involved in the penetration of the wool fiber by dyes of all types.

PENETRATION OF METALLIC SALTS.—Chrome dyes in their unchromed state exhibit the same general characteristics of penetration as acid and milling dyes. The characteristic change of shade, exhibited by most chrome dyes (e.g., Calcochrome Red ECB, C.I. 652), during chromation, however, afforded an opportunity to study the mode of penetration of the chromium into the fiber. Rapid penetration of chrome was observed in damaged areas, sheared ends of fibers, and through incisions, by the early development of the chromed shade in these regions. The appearance of the chromed shade in regions of normal scale structure was observed to take place much less rapidly, demonstrating the influence of the cuticle on the penetration of the fiber by metal salts. In most cases, however, the color change to the chromed shade was largely completed throughout the fiber within ten minutes or less at the boil. Since, in general, wool is boiled for 1 to 2 hours prior to top chroming, and, since the bichromate in solution is not aggregated, the roles of swelling and the so-called "pore" structure appear to be secondary to that of the scale structure in the penetration of chrome into the wool fiber.

Similar experiments have shown that the cuticle also controls the rate at which metallic salts, such as aluminum sulfate, cobalt acetate, copper sulfate, and ferrous sulfate, penetrate the dyed fiber to form metal complexes. As reported previously*(9)* the damaged tips, under normal dyeing conditions, absorb the metal salt first. With the passage of time and in the presence of a sufficient concentration of the salt, other parts of the fiber will also exhibit metallization of the dye, but at a much slower rate. If the scale structure is damaged by crushing after dyeing, but prior to metallization, the metal salts then penetrate the tips and crushed areas simultaneously and at the same rate. When the sheared body end and the damaged tip of an individual fiber are examined microscopically after dyeing with a chromable dye in the presence of 2 p.p.m. of

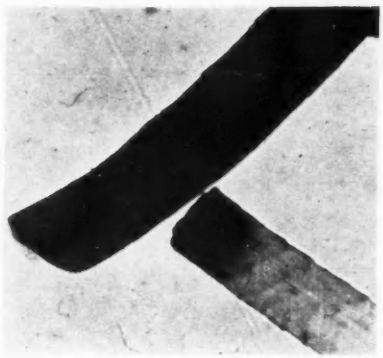

Figure 7

Tip and sheared body end of the same fiber dyed metachrome with 2% Calcochrome Fast Green SGV. The tip end is completely dyed and appears black in photomicrograph. The sheared body end is undyed, except where dye has penetrated through the cut end.

aluminum, chromium, cobalt, iron, or other metal in solution in the dyebath, the dye in the damaged tips and the sheared body end will be metallized, although in all normal parts of the fiber the dye will remain unmetallized (Figure 7).

The radioautograph shown in Figure 8 was produced by a staple of Australian wool dyed with Calcochrome Fast Green SGV in the presence of 4 p.p.m. of radiocobalt (Cobalt^{60} isotope) acetate-chloride mixture using the procedure described previously*(9)*. It can be seen that the damaged tips and sheared body ends have absorbed most of the radioactive isotope, confirming the statement that metal

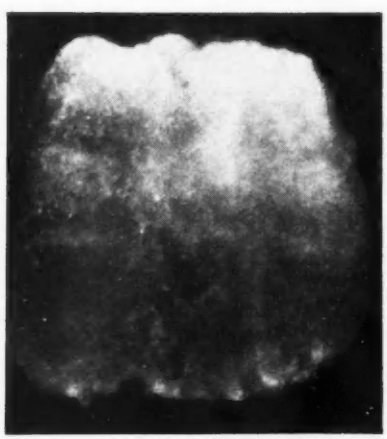

Figure 8

Radioautograph of a staple showing concentration of radiocobalt isotope^{60} in the tips and sheared body ends of fibers. Top of the staple is the tip end.
3% Calcochrome Fast Green SGV
6% Ammonium sulfate
4 p.p.m. radiocobalt isotope^{60} mixture
Boiled 1 hour.
In contact with film 48 hours

salts behave in the same manner as dyes and penetrate more rapidly when the cortex of the wool is directly accessible.

Other examples of local metallization of chromable dyes afford further evidence of the dependence of the penetration of metal salts upon the condition of the cuticle. A 2% dyeing of Calcochrome Blue Black Conc. (C.I. 202) was made with the addition of 3 p.p.m. copper at a liquor ratio of 60:1 and then top-chromed in the regular manner. It has been shown *(9)* that this amount of copper is insufficient to metallize all of the dye in the fibers. Therefore metallization takes place only in those regions of the fiber into which the metal can most easily penetrate. Microscopical examination of fibers mounted longitudinally revealed small areas of the pink-violet copper complex shade in the neighborhood of irregularities in scale formation. A similar coloration existed in the damaged tips, while all normal parts of the fiber exhibited the blue shade produced by chromium, indicating the concentration of copper in areas of damaged scale structure. Similarly, an acid dyeing of 2% Calcochrome Violet B, dyed with 3 p.p.m. of iron, exhibited a brown shade wherever the iron had penetrated locally and metallized the Violet B, while the normal parts of the fiber were the rich scarlet shade of the unmetallized dye. Similar effects can be obtained in general with other metals and chromable dyes, establishing the role of scale structure in the penetration of trace metals into the wool fiber.

Tippy-dyeing studies have shown that the scale structure in the tips of fleece fibers has been disorganized by exposure to sunlight and weather while growing on the sheep. This degradation is readily apparent under the microscope. In some cases scales may be observed protruding from the fibers at regular intervals in step formation (Figure 9), while in others the loosened scales appear as comparatively large plates without definite form. (Figure 10). In such fibers, dye penetration occurs first and most rapidly in the tip regions. Equally rapid penetration can be obtained in any part of the fiber, however, if the scale structure is mechanically damaged prior to dyeing. When a fiber is cut so that the cortex is exposed to the dyebath, the dye will penetrate both the naturally damaged and cut ends of the fibers at approximately the same rate.

Most chrome dyes produce a tippy effect on wool when dyed by the metachrome process. Calcochrome Fast Red ECB (C.I. 652) is a typical example of several dyes studied. When this dye is applied with 5% ammonium sulfate, and

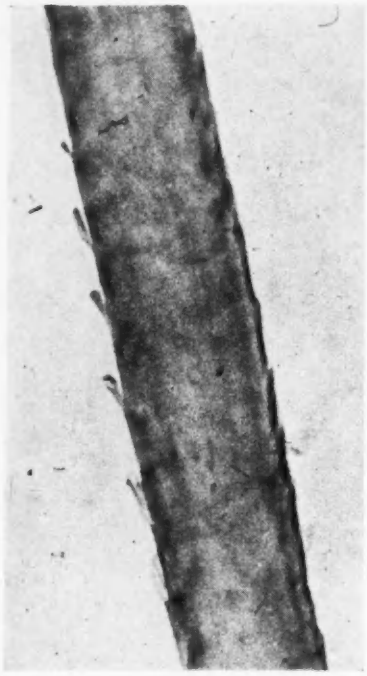

Figure 9

Protruding scales on tip of wool fiber after dyeing with
2% Calcochrome Alizarine Red SC
8% Anhydrous Glauber's salt
5% acetic acid, 28%
Boiled 45 minutes. Not chromed.

3% metachrome mordant, the tips and other damaged parts of the fiber are dyed heavily, while the body part remains lightly dyed or undyed. Figure 11 shows a tip and body part of the same fiber; the tip is heavily dyed, while the body is undyed except for a small area on one side of the fiber in which the epicuticle has probably been damaged. This same dyeing of Australian fleece produced a tippy fiber whose bulbous root and tip were both intact. The damaged tip and scale-less end of the root were heavily dyed, while all other portions of the fiber remained undyed (Figure 12). The presence of a well-developed scale structure over the entire fiber down to and including part of the bulb at the root end is clearly indicated by this observation.

A dyebath containing 3% Calcochrome Red ECB, 5% Durfee Metachrome mordant and 2% acetic acid, 28%, which has been boiled previously for 1½ hours in the absence of wool, may be used to detect areas of physical or chemical damage. Damaged areas of wool fibers rapidly absorb the chromed dye and acquire a deep crimson shade, while undamaged wool remains only slightly tinted, even after 60 minutes boiling.

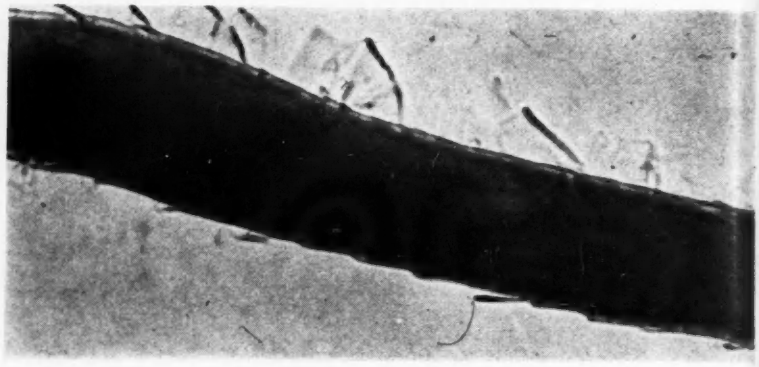

Figure 10

Wool fiber showing scales sloughing off the tip, after dyeing with 2% Calcochrome Alizarine Red SC, 8% anhydrous Glauber's salt, 5% acetic acid, 28%; boiled 45 minutes. Top-chromed with 1% sodium bichromate, boiled 40 minutes.

CHEMICAL SURFACE ATTACK.—In addition to natural and artificial physical disorganization of the surface scale structure of wool, chemical attack may readily modify the cuticle and affect the penetration of dyes into the fiber. Among the more common practical treatments useful in the preparation of woolen and worsted materials are various forms of chlorination, alcoholic potash treatment, bleaching with hydrogen peroxide, and stripping with hydrosulfite or zinc formaldehyde sulphoxylate. Wool treated by any of these processes exhibits increased rates of penetration by dyes due to the chemical degradation or modification of the cuticle.

As an example of chemical treatment of wide interest at the present time, the effect of chlorination was studied in considerable detail in this investigation using Australian fleece wool. The fibers were treated by immersion in solutions of sodium hypochlorite adjusted to afford both acid and alkaline chlorination conditions. The rate at which the fiber is attacked in these solutions is dependent upon both the concentration and the pH of the treating liquor, as shown by the approximate times of treatment required for the appearance of Allwörden sacs recorded in the following table:

Sodium Hypochlorite Conc. g./l	*pH*	*Time of Treatment*
1.0	4.5	30 to 45 seconds
2.0	4.2	15 seconds
0.2	4.1	12 minutes
2.0	8.3 to 8.4	12 minutes
0.2	8.5	sacs not observed

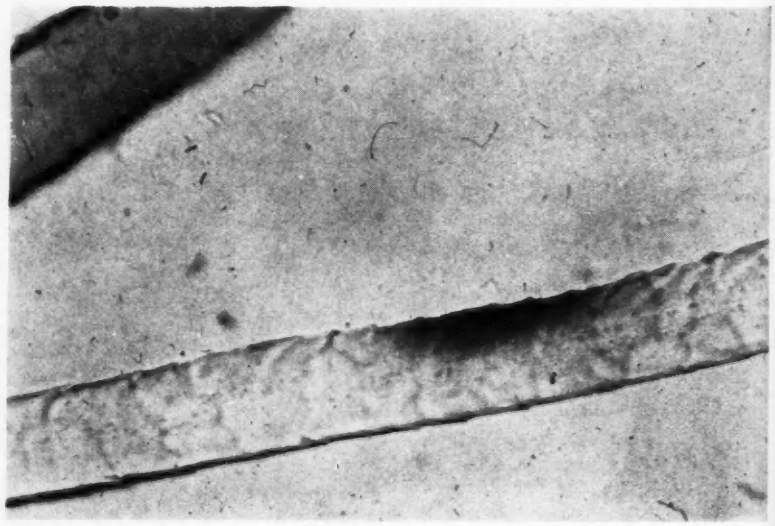

Figure 11

Tip and body segments of same fiber dyed metachrome with 2% Calcochrome Fast Red ECB. The tip is uniformly dark; the body shows only a local area of dye penetration.

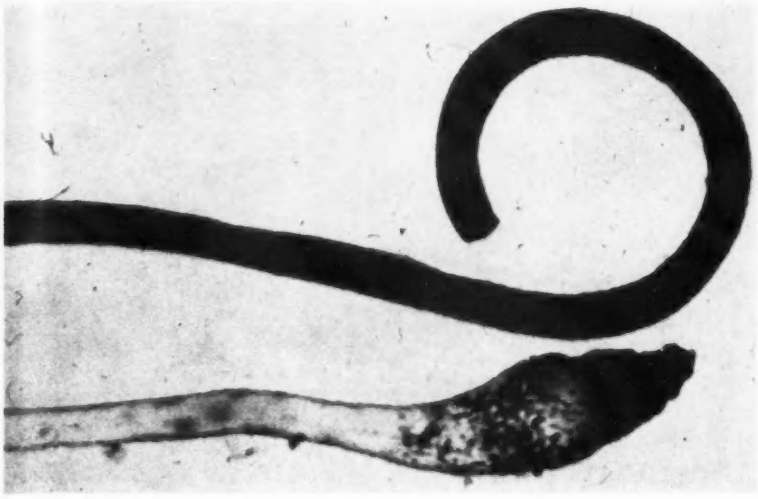

Figure 12

Tip and root ends of the same fiber dyed metachrome with 2% Calcochrome Fast Red ECB. The presence of the dye resistant cuticle over most of the fiber and the bulbous root is revealed by the absence of uniform dye penetration. Only the extreme root end and the weathered tip of the fiber have absorbed dye deeply and uniformly.

The development of the Allwörden sacs is shown in the accompanying figures, (13-20) showing successive stages of the action. Previous investigators *(10, 11, 12)* have described these formations, which arise because of osmotic pressure developed beneath the epicuticle by the action of chlorine on the fiber. The epicuticle itself is apparently permeable yet chemically resistant to chlorine or hypochlorite ions. This is demonstrated by the presence of Allwörden sacs only in areas free from previous mechanical or chemical damage, and by the persistence of the sacs under continued exposure to chlorination attack.

The location on the fiber at which chemical attack has occurred in these treatments was made apparent by a 30-second immersion of the treated fibers in a 0.02% solution of Calcozine Red BX (C.I. 749) at room temperature, followed by rinsing with water. Untreated fibers subjected to this staining technique for as long as 15 minutes at room temperature remain practically colorless except for heavy staining in the tip region. A few scales were noted in some fibers which exhibited a light pink tint along the fringe or distal end. Areas of chlorination attack, on the other hand, were stained deep pink, contrasting sharply with the normal fiber. The progress of chemical attack was observed by immersing fibers from the same staple in the chlorinating bath for intervals ranging from 5 seconds to 5 minutes, rinsing quickly, and then dyeing with the Calcozine Red BX solution (Figures 21, 22). These experiments demonstrated that, under both acid and alkaline conditions, the protective action of the epicuticle

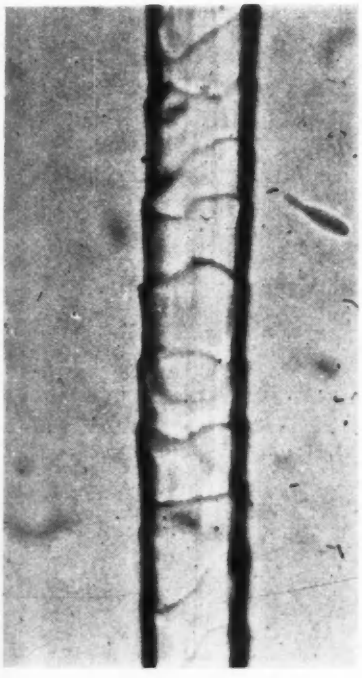

Figure 13

Wool fiber showing scale structure prior to treatment with acid hypochlorite solution. The effect of this treatment on this fiber is shown in Figures 14, 15, and 16.

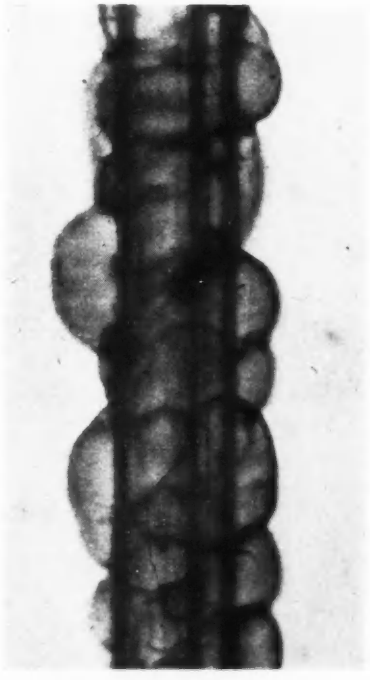

Figure 14

Wool fiber showing stained Allworden sacs formed during 45-second exposure to acid (pH 4.2) hypochlorite solution.

Figure 15

Wool fiber showing color being bleached from Allworden sacs during further treatment with acid hypochlorite solution. Note partial disintegration of sac on left side of fiber.

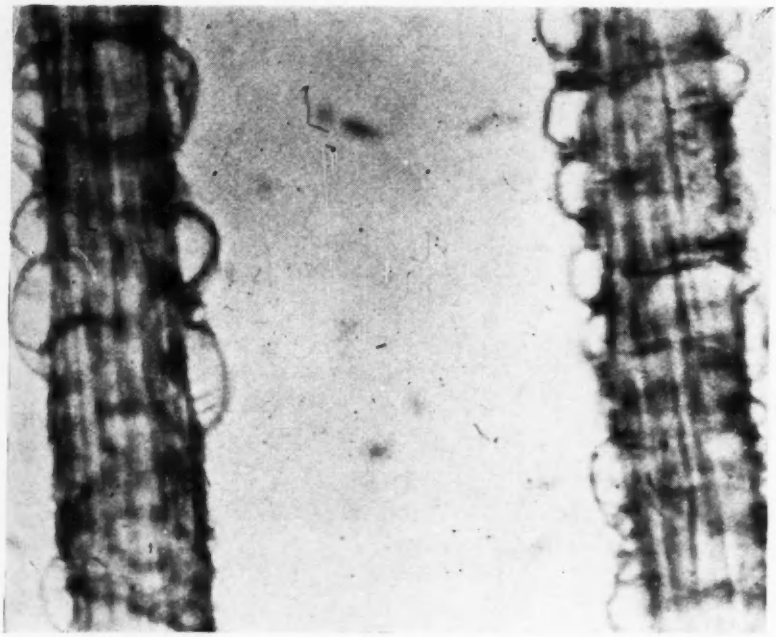

Figure 16
Fibers after severe attack by acid hypochlorite solution showing ruptured and collapsed Allworden sacs. Original scale structure has now been destroyed. Characteristic longitudinal striations of severely damaged wool fibers are now prominent.

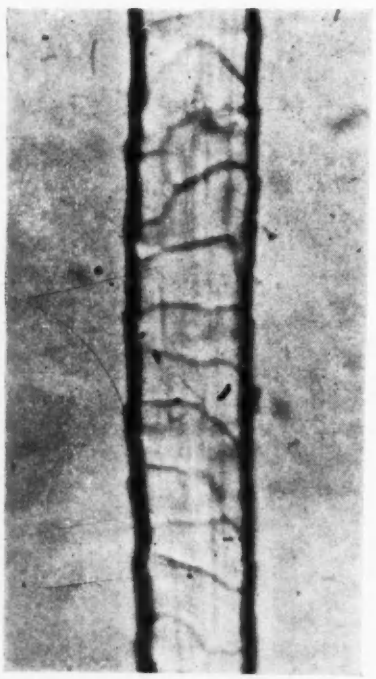

Figure 17
Wool fiber prior to treatment with alkaline (pH 8.5) hypochlorite solution. The effect of treatment on this fiber is shown in Figures 18, 19, and 20.

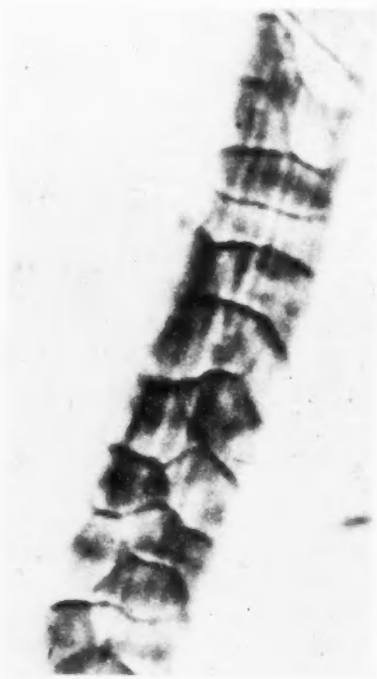

Figure 18
Wool fiber treated for 1½ minutes with alkaline hypochlorite (pH 8.5) solution, rinsed and stained with Calcozine Red BX solution to show scale dyeing.

Figure 19
Fiber after treatment with alkaline (pH 8.5) hypochlorite solution for 4 minutes. Rinsed and stained with Calcozine Red BX solution. Fiber severely attacked, scales no longer visible, gelatinous film involving the exocuticle developing on surface of fiber.

under chlorination breaks down first at the distal ends of the wool scales along the fringe or edge. Confirming Whewell's observations*(16)*, the attack progresses irregularly towards the base, or proximal end, of the scale with increased time of immersion. As revealed by the staining technique, all scales are not equally affected, some exhibiting considerable resistance to attack during short intervals of immersion (Figure 23). A treatment of two minutes duration in an acidified (pH 4) solution containing 1 g./liter of sodium hypochlorite, however, is sufficient to result in deep and uniform staining over the entire surface of the fiber.

In a similar study of the action of stripping, bleaching, and dyeing assistants, wool fibers were treated four times ranging from 5 seconds to 15 minutes in solutions of the following agents:

sodium hydrosulfite
zinc formaldehyde sulfoxylate
sulfuric acid
hydrogen peroxide (10-volume)
sodium hydroxide
peracetic acid

These chemical treatments were followed by rinsing thoroughly and immersing in a buffered solution, pH 7, overnight. The fibers were then rinsed in distilled water and stained in the same manner as above.

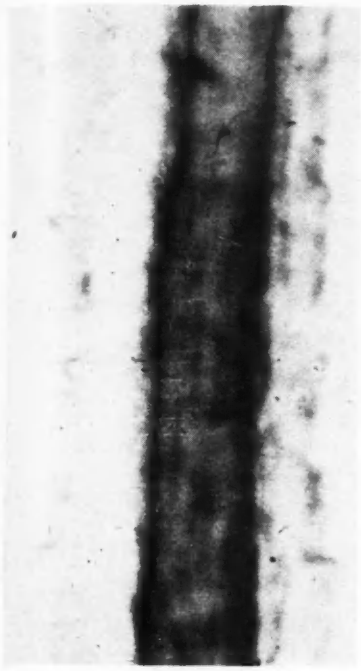

Figure 20
Fiber after further treatment with alkaline (pH 8.5) hypochlorite solution, showing further disintegration and an increase in size of the gelatinous film surrounding the fiber.

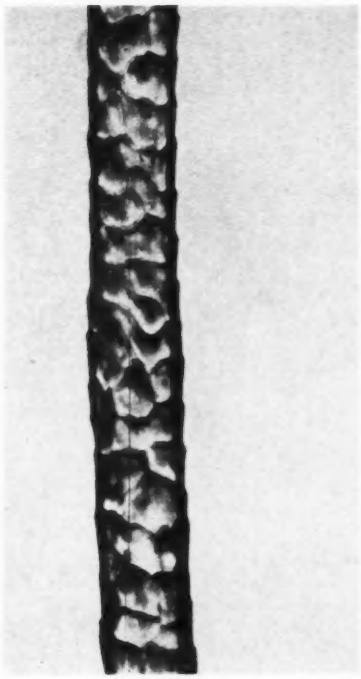

Figure 21
Photomicrograph of body section of wool fiber after treatment with a weak hypochlorite solution (pH 4.1) and stained with Calcozine Red BX. The distal ends of the scales are heavily dyed showing the location of the initial chemical attack. The dark lines bordering the fiber should be disregarded.

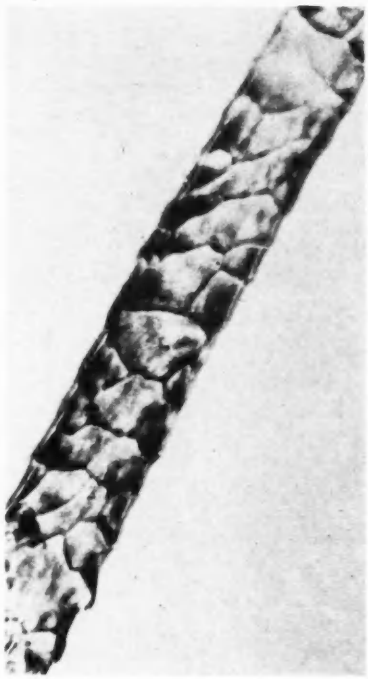

Figure 23
Wool fiber rinsed and stained with Calcozine Red BX at an early stage of acid chlorination, showing the location of initial chemical attack at the distal ends of the scales and the difference in resistance to attack between individual scales. Note partial detachment of scales near upper end of the fiber.

In each of these treatments the first indication of attack was noted at the scale fringes, although the rate at which chemical modification proceeded varied between reagents. These results, together with those observed in the chlorination studies, suggest either a greater inherent susceptibility to attack at the fringes of the scales or the influence of physical factors in the exposure of these regions to the reagent solution, as recently proposed by Alexander*(13)*.

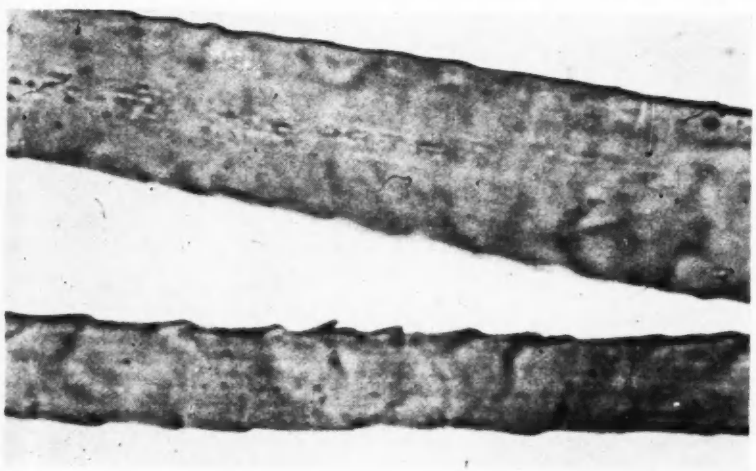

Figure 22
Tip and body sections of wool fibers after treatment with strong hypochlorite solution (pH 4.1) and staining with Calcozine Red BX. The tip (upper fiber) and body (lower fiber) show equal absorption of dye.

As a group, acid wool dyes penetrate both untreated and chlorinated wools similarly, and yield dyeings of comparable depth of shade, although the temperature at which the first penetration can be observed is lower in the case of the treated wool. In a number of cases slightly increased final color value is obtained on the treated wool. Similarly, chrome and metallized types also exhibit earlier penetration and more uniformly and equally dyed fibers with chlorinated wool than with untreated wool. Certain metallized dyes, such as Calcofast Wool Blue BN, dyed with 4% sulfuric acid yield a heavier shade on chlorinated wool in 1 hour than can be obtained on normal wool in 1½ hours with 8% sulfuric acid.

In a number of cases in which normal wool yields pale or skittery dyeings with certain metal-dye complexes (as for instance with cobalt complexes of Calcochrome Violet B or Brown RH) full level shades are obtained on chlorinated wool. This is also true of many chrome dyes applied by the metachrome procedure, although the same dyes cannot be applied successfully to untreated wool by

the metachrome method. The chemically modified cuticle permits rapid and uniform penetration of both the dye and dye-chromium complex into the cortex. Untreated fibers, and portions of the treated fibers still protected by normal scale structure, remain only lightly dyed. Calcochrome Fast Green SGV, Silk White Red B, Blue Black (C.I.202), and Red ECB afford good examples of this behavior. The latter may be metachrom-dyed successfully in full shades on chlorinated wool, but is well known to be unsuitable for application to ordinary wool by this method. In this case, the permeability of the modified cuticle to the chrome-dye complex has been demonstrated by the procedure outlined above in which the dye is entirely converted to the chrome complex prior to entering the wool into the dyebath.

The role of scale structure is evident in the successful use of the metachrome procedure on treated wools, while with ordinary wool the process must be restricted either to those dyes which in the unchromed state are able to penetrate the cuticle rapidly and uniformly at temperatures below that at which chromation can occur in the dyebath, or to types whose chrome-dye complex can penetrate the normal cuticle of the fiber with comparative ease. In all cases, chlorinated wool fibers exhibit superior penetration of dye in cross-section and more uniform distribution of the dye along the length of the fiber when examined longitudinally. The improvement in penetration can be attributed chiefly to the effect of the chlorination treatment on the scales of the wool fiber, while the increased over-all depth of shade is due to the uniformity of color distribution in and between the individual fibers. It is of interest to note further that the depth of shade and rate of penetration of chlorinated wool is approximately equal to that of the damaged tips of unchlorinated wool even when both wools are conditioned in a pH 7 buffer solution for 24 hours prior to dyeing together in the same dye bath.

ACKNOWLEDGMENT

The authors wish to acknowledge the help of the following members of the Technical Staff of the Calco Chemical Division in obtaining information, mounting fibers, preparing photographs for publication, and reviewing the manuscript:

Miss F. Gustafson, C.A. Amick, J. J. Black, R. H. Kienle, C. Maresh, and A. L. Peiker.

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2nd Annual Pacific Southwest Outing

THE second annual outing of the Pacific Southwest Section was held at the Oakmont Country Club on Aug. 18th, 1950.

Forty-five members enjoyed the facilities of the club consisting of golf, swimming and other sporting events. Cocktails and dinner were served from six to nine, accompanied by entertainment.

In the golf tournament Robert Butler of Dyecraft, Inc. won the annual low gross cup presented by Sandoz Chemical Works, Inc. John Smith was runner up with F. B. Morton third. Winners of the other events were: John Smith—Low net, Robert Mishell—Runner Up Net, John Smith—Putting Contest, John Smith—Driving Contest, F. B. Norton—Eagle Eye Contest, and James Sandiford—Low Gross For Guests.

An assortment of prizes was contributed by the representative industries in this section for which our sincere appreciation is extended. Likewise we extend our sincere thanks to Bob Mishell, Chairman of the event for his splendid efforts in making this event an outstanding success.

The next regular meeting will be held at the Mayfair Hotel the evening of October 27th. More detailed information will be duly mailed the membership.

Respectfully submitted,

DAVID F. DRISCOLL, *Secretary*

EMPLOYMENT REGISTER

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers, who can obtain further information from the Secretary.

50-25

Education: B.S. in chemistry, with graduate work.
Experience: Research in textile chemistry.
Age 37; married; references; New England preferred.

9-18, 10-2

50-26

Education: B.S. in Textile Chemistry & Dyeing.
Experience: Textile chemist and colorist.
Age 33; married; references; southern New England preferred.

10-2, 10-16

50-27

Education: B.T.E., Georgia Institute of Technology.
Experience: Second hand in bleachery.
Age 26; married, references; South preferred.

10-2, 10-16

50-28

Education: Textile Chemistry and Dyeing, evening textile school following high school.
Experience: Overseer of dyeing, mainly on wool, piece and stock.
Age 37; married; references; New England preferred.

10-2, 10-16

New AATCC Tentative Test—

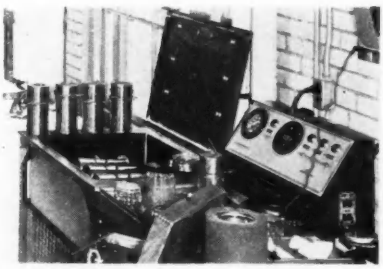
ACCELERATED WASHFASTNESS TEST

INTRODUCTION

IN presenting the new AATCC tentative wash test, Accelerated Wash Fastness Test #3A, the American Association of Textile Chemists and Colorists is providing the textile industry with a means of approximating in one 45-minute test the color destruction and abrasive action of five average commercial or home launderings. The new test supplements the present AATCC #3 wash test for cotton. While the older test provides a satisfactory means of evaluating the comparative fastness of dyed fabrics, it requires over two of these tests to produce an effect similar to one commercial laundering. In fact, comparative test data developed by the washfastness committee have demonstrated that twenty-two of these tests are necessary to produce a result comparable to 10 average commercial or home washings, a ratio of 2.2:1.

The new, tentative, accelerated test is the culmination of over six years of extended and comprehensive investigation by the AATCC Committee on Fastness to Washing under the successive chairmanships of Charles W. Dorn, Charles A. Seibert, and Charles A. Sylvester. It was initiated because of increasing complaints from the trade of excessive loss of color in laundering, and because of the failure, in some cases, of the present AATCC #3 test to predict the colorfastness of cotton fabrics that would be expected to withstand multiple commercial or home launderings. The net results of this research program, sponsored by the committee and conducted at the AATCC Research Laboratories at Lowell, Mass., resulted in the publication of a joint report entitled, "An Interesting Example of Cooperation", by the committee, the American Institute of Laundering, and the N. J. Laundry and Cleaning Institute in the AMERICAN DYESTUFF REPORTER, April 17, 1950.

In developing the new test, an effort was made to duplicate in the Launder-Ometer the abrasive action obtained in commercial laundering. To accomplish this, stainless steel tubes were designed to replace the glass jars ordinarily used.



Launder-Ometer Showing the new Stainless Steel Tubes

The tubes, 3½" in diameter by 8" long, are mounted in the Launder-Ometer horizontally at right angles to the shaft by means of an adapter which is very easy to install or remove. Mounted in this fashion the test specimens are subjected to a forceful throw, a long slide, and a strong impact. Twenty such tubes may be run at one time. The use of 100 stainless steel balls, as well as a lower liquor volume ratio than that employed in the present AATCC #3 wash test, also serve to increase the abrasive action.

After a series of Interlaboratory tests had demonstrated its reliability, the new test described as "Accelerated Wash Fastness Test #3A" was submitted to the General Research Committee for vote. The General Research Committee has officially accepted this method as a tentative standard.

ACCELERATED WASHFASTNESS TEST NO. 3A

Cotton and Linen Textiles: Colorfastness to Commercial Laundering and Domestic Washing

Scope

This accelerated laundering test is applicable to cotton or linen textiles in fabric form. It is especially designed for evaluating the washfastness of textiles that are expected to withstand frequent laundering. The color loss and abrasive action of 5 average commercial or home launderings are closely approximated in one 45-minute test.

Apparatus

Launder-Ometer *(1)*.

Stainless steel cylindrical containers, 3½" x 8" *(1)*.

Metal adapters (to hold containers on Launder-Ometer shaft) *(1)*.

Stainless steel balls, ¼" dia. *(1)*.

Materials

Soap (Federal Spec. P. S. 566 or ASTM-D 496).

Sodium meta silicate, technical ($Na_2SiO_3 \cdot 5H_2O$).

Acetic acid, 28%.

Multifiber test fabric *(2)*.

Test Specimens

One 2" x 6" specimen is used in each container.

It is recommended that knitted fabrics be sewn or stapled at the four edges to 2" x 6" pieces of 80 x 80 count bleached muslin to avoid rolled edges and to assist in obtaining a uniform test result over the entire surface area.

A 2" square of 80 x 80 count bleached muslin or of AATCC multifiber test fabric may be added to determine staining.

Procedure

Adjust the Launder-Ometer to maintain a bath temperature of 160°F.

Prepare the required volume of wash liquor, 50 ml. for each test, made up to contain 0.2% soap and 0.2% sodium meta silicate. Preheat the solution to 160°F. and measure 50-ml. portions for each test into separate beakers. Enter a well-crumpled test specimen into each beaker and thoroughly saturate with warm solution.

Place 100 steel balls into each container and clamp the covers. Place the containers horizontally in the adapters on the rotor of the Launder-Ometer with the covers facing the operator and arranged so that an equal number of containers is on each side of the shaft. Start the rotor and run for not less than two minutes to permit the containers to preheat to 160°F.

Stop the rotor and with a row of the containers in an upright position unclamp the cover of one container, enter a test specimen and the solution and replace the cover but do not fasten it. Repeat this operation until all containers in the row have been loaded. Then clamp the covers

in the same order in which the containers were loaded. (Cover clamping is delayed to allow equalization of pressure). The second row of containers is loaded in the same manner.

Start the Launder-Ometer and run for 45 minutes. Stop the machine, remove the containers and empty the contents. Rinse each test specimen twice, in beakers, in fresh 100-ml. baths of water at 105°F. for one-minute periods with occasional stirring or hand squeezing. Sour in 100 ml. of a 0.014% solution of acetic acid (0.5 ml. of 28% acetic acid per 100 ml. of water) for 1 minute at 80°F. Rinse again for one minute in 100 ml. of water at 80°F. Hydroextract or pass the test specimens through wringer rolls to remove excess moisture and dry them by pressing with an electric iron heated to 275°-300°F.

Evaluation

Specimens subjected to this test should show color damage similar to that produced by five average commercial or home launderings.

A system of rating is being developed for this test.

Notes

A standard test control fabric is under consideration that will indicate whether or not the test has been satisfactorily completed.

(1) Atlas Electric Devices Company, 361 West Superior Street, Chicago 10, Illinois.

Inconel Specimen Containers 3½" diameter x 8" for use in the Launder-Ometer.

Adapter plate for holding five Inconel Specimen Containers.

(Prices and further information are available from Atlas.)

(2) Werner Klaas, Testfabrics, 224 West 35th Street, New York 1, N. Y.

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Report of S. C. Summer Outing

THE South Central Section held their annual summer outing at the Chattanooga Golf and Country Club on August 18th and 19th. There were 150 members and guests in attendance.

Men's sports included a golf tournament, horseshoe pitching and fly casting. Ladies activities included games, bridge and canasta. A large array of prizes was given for sports and women's activities. There was also a number of door prizes given at the banquet.

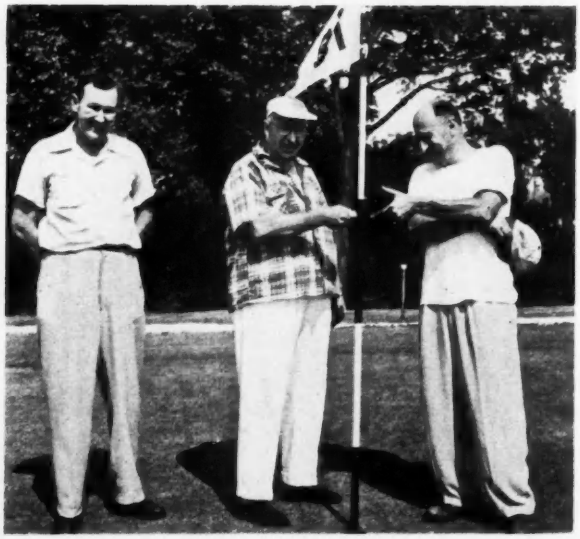
In addition to sports the program included cocktail parties, buffet suppers and dances Friday and Saturday nights.

The annual banquet was presided over by J. H. O'Neill of Riegel Textile Corporation, Trion, Georgia, Section Chairman. C. Norris Rabold, President of the Association, was the main speaker and was introduced by Jack Welborn of Riegel Textile Corporation. A. J. Kelly of Burkart-Schier Chemical Company took pictures of the outing.

SOUTH CENTRAL SECTION OUTING PHOTOS

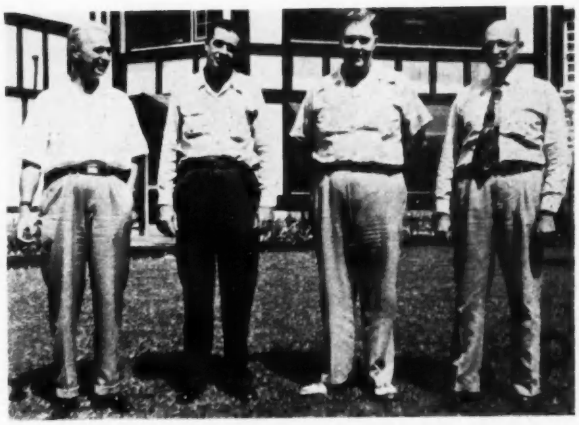
Charles Spratt, National Aniline Div., General Chairman of the Outing.

Henry Gaede, Laurel Soap Co.; Fowler Jackson, Laurel Soap Co., Irving Royce, Royce Chemical Co.; George Wellworth, W. Lowenthal Co.

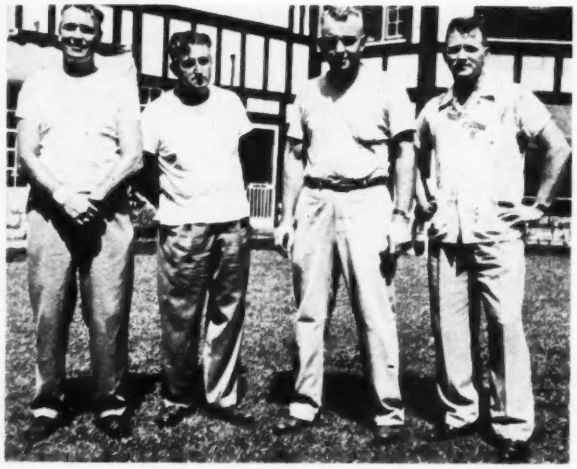


Glenn Bellamy, Ciba Co.; Samuel Hayes, Ciba Co.; Frank Cater, Ray-Ser Dyeing Co.

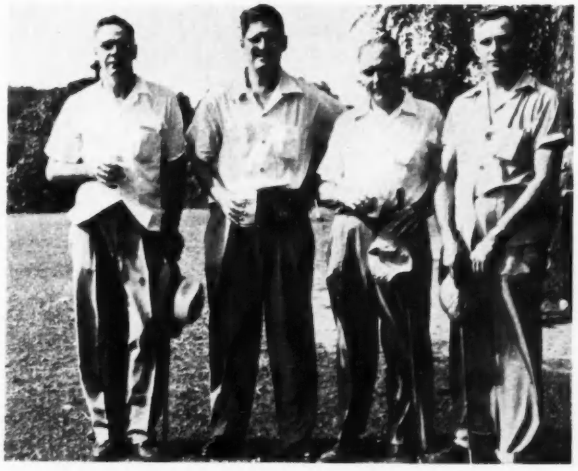
Jack Welborn, Riegel Textile Corp.; C. Norris Rabold, National President, AATCC; Joseph O'Neill, Chairman, South Central Section.



Alex Campbell, Althouse; Harrell Asbury, du Pont; Charles Glass, Ray-Ser Dyeing Co.; Stewart Morrison, du Pont.

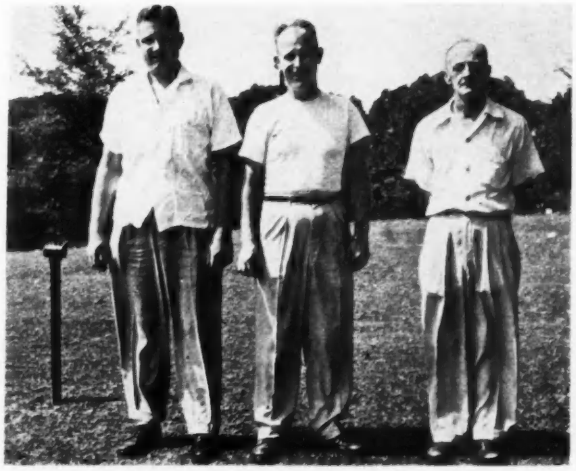


E. V. Helms, Geigy Co.; T. J. Marler, Marler Chem. Co.; Walter Motter, Tennessee Hosiery Co.; William Dooley, Marler Chem. Co.



George McCarty, Burkart-Schier; Rudd Hardesty, Davenport Hosiery Mills; A. T. McDowell, Solvay; Everett Burgner, Davenport Hosiery Mills.

William Blackmon, Sandoz Chem. Works; Charles Spratt, National Aniline Div.; Jack Anderson, Peerless Woolen Mills; Dan Rion, Napco Chemical Co.



James Simmons, Riegel Textile Corp.; Jack Welborn, Riegel Textile Corp.; Thomas Sledge, Miller Smith Hosiery Mills.

Student Paper Contest—

THE EFFECT OF ABRASION ON THE DYEING CHARACTERISTICS OF COTTON*

KENNETH A. JENKINS and HAROLD F. KEELS
Dept. of Textile Chemistry and Dyeing, School of Textiles, North Carolina State College

When cotton knit goods are abraided in a small area with sandpaper mounted in a Crockmeter, the abraded area has more affinity for some dyes than has the unabraded area. The chemical condition of the goods before and during abrasion influences the effect of abrasion on modification of dye affinity. Experiments indicate that the effect of abrasion on affinity can be minimized by selection of dyes.

INTRODUCTION

FOR some time the dyers of knit goods have been faced with the problem of streaked or localized heavily dyed areas on their fabrics. Various opinions have been advanced as to the probable cause for faulty dyeings of this nature. It has been assumed by many dyers that abrasion during processing or dyeing in some way produced this uneven appearance, but no experimental evidence has been reported to substantiate this belief. Therefore, it seemed advisable to study this effect of abrasion under a variety of conditions on the dyeing properties of cotton. In this way it is hoped to contribute fundamental information concerning this phenomenon that might lead to the discovery of a method to minimize or overcome the difficulty.

METHODS AND MATERIALS

In order to standardize the method of abrasion, samples of the material were placed on the peg of a standard AATCC Crockmeter and given two strokes against 7/0 waterproof sand paper.

This standardized procedure was carried out on cotton knit goods that were either dry, or first wet with water, or wet with a one-percent solution of a sodium carbonate, or wet with a one-percent solution of sodium hydroxide. These treatments were used on grey, on scoured, and on bleached goods. All of this material came from the same lot.

Abraded samples were dyed respectively with three different direct dyes, with a vat dye, with a naphthol dye, and by a differential dyeing technique. The differential dyeing technique was developed by the Southern Regional Research Laboratory especially for judging the maturity of cotton. Dyeings of each color on each set of four specimens were carried out in the same dye bath at a 40:1 liquor ratio.

With direct dyes, the dyeing was started at 140°F. with 0.5% of dye, the temperature was raised to the boiling point and dyeing was continued for thirty minutes. Then, ten percent of salt was added, and dyeing was continued for another thirty minutes. The samples were then rinsed well and dried. The following dyes were used: Solantine Yellow FF Concentrated, Pontamine Fast Green GL, and Diphenyl Fast Brown BRL. These dyes represent merely an arbitrary color selection.

Two percent of a vat dye, Ponsol Brown VR paste, was applied by the reduced method and by the pigment method. In the former method the samples were dyed for forty-five minutes, while in the latter method the samples were pigmented for twenty-five minutes, the dye was reduced, and dyeing was continued for twenty minutes. Finally, the samples were rinsed, oxidized, and soaped.

To show the effect of azoic dyes, the samples were prepared by a simulated-jig method with four ounces per gallon of Naphthol AS and coupled in a bath containing three ounces per gallon of Ciba Scarlet Salt I.

RESULTS AND DISCUSSION

The effect of abrasion on the dyeing properties of cotton knit goods is readily noted with the direct colors, Diphenyl Fast Brown BRL, and Pontamine Fast Green GL. The area of abrasion dyed a much darker shade; it was further noted that the condition of the sample during abrasion greatly influenced the depth of shade obtained on the abraded area. The least effect was noted when the samples were abraded in the dry state, and the greatest occurred when the samples were wet with water or sodium carbonate prior to abrasion. Moreover, the effect produced depended on the extent of purification of the goods, the effect being greatest in the case of grey goods, and least in the case of bleached goods. Not all direct dyestuffs exhibited this uneven dyeing on abraded goods, as was shown by the results obtained with Solantine Yellow FF Concentrated. In this case the abraded areas may be noted only with difficulty. This was also noted with the azoic dye.

When Ponsol Brown VR Paste was applied to the samples there was also a definite difference in shade caused by abrasion. These shade changes were comparable to those noted when brown and green direct dyes were used. The same results were obtained by using the reduced and pigment methods.

The differential dyeing technique with a green dye and a red dye *(1)* was used to show that the effect was not optical, such as that which might be obtained when a napped fabric is brushed one way. When the differential dyeing was used, the abraded portion of the sample dyed green while the unabraded portion dyed red. This indicates definitely that the abrasion in some way alters the dyeing characteristics of the cotton fibers, for in the differential dyeing procedure a mixture of two dyes is used, and the abraded area shows a preference for the green component.

The results obtained with the differential dyeing technique on abraded fibers raises an extremely interesting question as to the factors involved in the initial entry of dye molecules into the surface

* Presented at Winston-Salem, N. C., before Piedmont Section on April 1, 1950, as entry in Student Paper Contest.

areas of the cotton fiber. If disruption of the cotton fiber surface by a purely mechanical action can, as appears evident from this work, change the dyeing properties of the fiber so materially, it would almost seem necessary to postulate a very thin surface layer, which is resistant to chemical action but susceptible to abrasion, and which is relatively impermeable to dye molecules above a certain molecular size, in order to account for the differential dyeing effect observed.

Further research along these lines is being carried out in the Department of Textile Chemistry and Dyeing at North Carolina State College.

SUMMARY

The foregoing results indicate that abrasion may radically change the dyeing characteristics of cotton. Definite proof that this shading is not optical can be readily seen when the differential dyeing technique is used. The fact that a direct yellow and a naphthol dye showed no shading on the abraded samples suggests that careful selection of dyestuffs may minimize the apparent effect of abrasion on cotton knit goods. Further, a highly alkaline bath during processing seems to reduce the effect of abrasion. Consequently, the results signify that further investigation into controlled processing and color receptiveness of abraded fibers would bring forth a possible solution of this industrial problem.

Note: The exhibits of dyeings submitted with this paper show clearly the evidence discussed by the authors.—*Editor.*

REFERENCE

1. Goldthwait, Smith and Barnett, "New Dye Technique Shows Maturity of Cotton," *Textile World*, 97, 105 (1947).

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NNE Fall Meeting to Include Round Table Discussion

THE first fall meeting for 1950 of the Northern New England section will be held on October 20th at the Lowell Textile Institute, Lowell, Massachusetts.

The Program follows:

4 P.M.—Informal round table discussion on Laboratory Dyeing Techniques with Relation to Shade Matching and Dyestuff Testing. The Moderator for the session will be C. Wendall Lever, Laboratory Supervisor, Goodall Sanford Inc., assisted by Milton G. Dimon, Branch Laboratory Director, E. I. DuPont de Nemours & Co. Inc.; John N. Dalton, Director of Chemical Department, Pacific Mills, Worsted Division; Arthur F. Gallagher, Chemist, Hayward Schuster Woolen Mills, Inc.; Henry F. Weidman, Textile Colorist, General Dyestuff Corp.; and Professors John H. Skinkle, John J. McDonald and Charles L. Howarth of the Lowell Textile Institute.

6:30 P.M.—Dinner in the School Cafeteria.

8:00 P.M.—A paper will be presented by Henry E. Millson, Ass't. Director, Application Research Laboratories, Calco Chemical Div., American Cyanamid Company, entitled "Colorfast Dyes—Their Applications and Properties".

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Nominating Committee, Supplementary Report

DUE to a nomination by petition, the nominations for officers in the year 1951 are now—

For President—C. Norris Rabold.

For Vice Presidents (two to be elected) —J. Robert Bonnar, Arthur W. Etchells, George O. Linberg.

H. C. CHAPIN, *Secretary.*

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CALENDAR

COUNCIL
Meeting: Nov. 17 (New York).

NATIONAL CONVENTIONS
1951: October 17-18-19, Statler, New York.
1952: Boston.

HUDSON-MOHAWK SECTION
Meetings: Oct. 20 (Utica), Dec. 8 (Albany), Jan. 19, 1951 (Albany), Mar. 16, 1951 (Albany), May 11, 1951 (Albany), June 22, 1951 (Annual Outing).

MID-WEST SECTION
Meetings: October 28, 1950, February 3, 1951 (Morrison Hotel, Chicago), May 5, 1951 (Hotel Schroeder, Milwaukee), June 16, 1951 (Outing, Lake Lawn Lodge, Delavan, Wis.).

NEW YORK SECTION
Meetings: October 13 (Swiss Chalet, Rochelle Park, N. J.), November 17 (Swiss Chalet), Jan. 12, 1951 (Hotel New Yorker), Feb. 23, 1951 (Hotel New Yorker), March 30, 1951 (Swiss Chalet), May 4, 1951 (Swiss Chalet), June 15, 1951 (Outing).

PACIFIC SOUTHWEST SECTION
Meeting: October 27 (Mayfair Hotel, Los Angeles, Cal.)

PHILADELPHIA SECTION
Meetings: October 28 (Meeting-in-Miniature, Philadelphia Textile Institute), December 8, January 19, 1951.

PIEDMONT SECTION
Meeting: October 28 (Charlotte, N. C.)

RESEARCH COMMITTEE
Meeting: Nov. 17 (New York).

RHODE ISLAND SECTION
Meetings: October 27 (Providence Engineering Society Hall), November 17 (Johnson's Commodore Room).

SOUTH CENTRAL SECTION
Meeting: Nov. 4 (Hotel Patten, Chattanooga, Tenn.).

SOUTHEASTERN SECTION
Meeting: December 9 (Atlanta, Ga.).

Membership Applications

CORPORATE

Grayco Products Company, Mexico, D. F.

SENIOR

Grace M. Anderson—Head Chemist & Dyer, Wolsey of Canada, Ltd., Quebec City, Canada. Sponsors: C. H. A. Schmitt, J. Loebel.

Dominic Andriacco—Colorist, MacGregor-Goldsmith, Cincinnati, Ohio. Sponsors: H. Waffenschmidt, G. Frye.

Stanley E. Auslander—Partner, H. & A. Mfg. Co., Phenix, R. I. Sponsors: R. H. Lewis, D. C. Hardman.

Herbert J. Barnett—Tech. Engr., Quaker Chemical Products Corp., Conshohocken, Pa. Sponsors: E. A. Richards, R. J. Mitchell.

Louis J. Boxser—Manager, Dartmouth Finishing Corp., New Bedford, Mass. Sponsors: K. J. Broden, H. M. Gorton, Jr.

Cortlandt P. Briggs—Tech. Service, Fiber Chemical Corp., Matawan, N. J. Sponsors: E. A. Leonard, A. R. Winch.

Albert Brunner—Chemist, Ciba Ltd., Basle, Switzerland. Sponsors: P. Kronowitt, F. Max.

Arthur R. Connor—Supt. of Bleachery Div., Compania Textilera Ariguanabo S.A., Bauta, Cuba. Sponsors: I. S. Hurd, W. E. Murray.

Philip B. Dalton—Research Chemist, Colgate-Palmolive-Peet Co., Jersey City, N. J. Sponsors: J. A. Woodhead, E. Zerner.

John J. Derrig—New England Mgr., American Cyanamid Co., Providence, R. I. Sponsors: R. C. Morrison, W. E. Small.

Edward F. Dinneen—Supt. Dyeing & Bleaching, Oneita Knitting Mills, Utica, N. Y. Sponsors: A. D. Truman, H. Gendreau.

Nicholas S. Dunten—Lab. Supervisor of Dye., American Finishing Co., Memphis, Tenn. Sponsors: H. A. Webb, W. E. Keeton.

Alex N. Engblom—Pres. of AB Dyestuff Chemical Corp., Gothenburg, Sweden. Sponsors: H. E. Hager, J. R. Bonnar.

Wendell K. Fitch—Sr. Engr., Bigelow-Sanford Carpet Co., Inc., Thompsonville, Conn. Sponsors: A. E. Nyquist, J. E. Lynn.

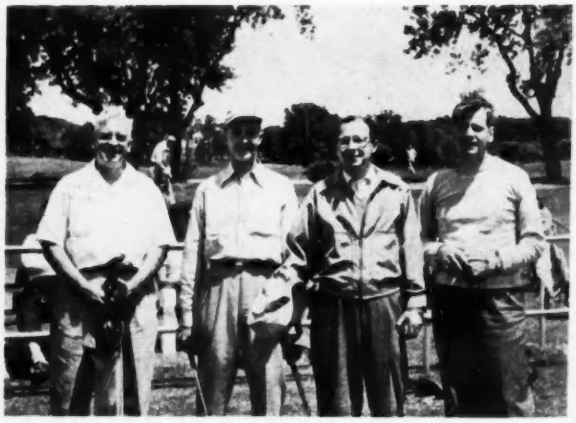
O. Grimnes—Managing Director A/S Sandvika Veveri, Oslo, Norway. Sponsors: C. Conradi, O. Falkenberg.

John D. Guthrie—Chemist, Southern Regional Research Lab., New Orleans, La. Sponsors: J. D. Dean, C. F. Goldthwait.

David Hamilton—Partner, H. & A. Mfg. Co., Phenix, R. I. Sponsors: R. H. Lewis, D. C. Hardman.

(Additional applications on Page P666)

PHOTOGRAPHS TAKEN AT THE MID-WEST SECTION OUTING, LAKE LAWN LODGE, DELAVAN, WISCONSIN, JUNE 17, 1950



*AATCC Sub-Committee**

LITERATURE SURVEY OF TEXTILE BLEACHING

JOHN F. HAGEN
Chairman

HISTORICAL

FOR centuries bleaching was carried out by subjecting the material to the direct action of sunlight. The first bleaching process in which chemicals were used consisted of applying wood-ash extracts, sour milk, sauerkraut juice and the like. With the development of the chemical industry more effective agents became available, i.e., soda ash, caustic soda, sulfuric acid, chlorinated lime, hypochlorite solutions, peroxide, and a multitude of others.

The bleaching process is generally considered to include also the preparation of the grey goods for the removal of lint, starches, fats and waxes, as well as the softening of the motes and shives prior to the actual bleaching. The simplification and speeding up of these operations have progressed with improvement in technical knowledge and instruments for measuring and controlling the operations and in the development of equipment to handle improved methods of operation. From a number of separate or batch operations requiring frequent rehandling and a long period of time to complete the bleaching process, we have now attained the so-called continuous bleaching process, which enables the bleacheries that are properly equipped to save time, labor and material.

Two of these bleaching systems, the continuous peroxide system and the semicontinuous hypochlorite system, have attained wide acceptance in the industry. It is for the purpose of facilitating a comparative study and analysis of these two systems that this literature survey has been made. In determining the scope of the survey, the Committee decided to confine it to the bleaching of textiles only. While the alkaline treatment preceding the hypochlorite treatment is invariably a batch process, it is here considered as part of the continuous bleaching process.

Most of the data have been obtained from *Chemical Abstracts* and *Applied Chemistry Reports* for the years 1900 to date. However, the Committee has considered all possible sources, and we feel a full coverage of all pertinent published literature on the subject is included in this report.

* AATCC Subcommittee, which conducted survey, consisted of W. R. Adams, T. E. Bell, R. L. Carr, R. S. Cox, A. D. Damon, H. O. Kaufmann, P B. Reuman, R. A. Secord, F. R. Tripp, A. R. Wachter and John F. Hagen, *Chairman*, who prepared this final report.

PART I

CONTINUOUS AND SEMICONTINUOUS BLEACHING—HYPOCHLORITE VERSUS PEROXIDE

CONTINUOUS AND SEMICONTINUOUS BLEACHING

GENERAL

1. Textile Finishing Machinery. Edward S. Pierce. *Am. Dyestuff Reptr.* 37, P186-91 (1948). A review of developments in the field of textile finishing machinery including continuous bleaching equipment, tenter frames, and continuous vat-dyeing machinery.

2. New Textile Techniques Await Commercial Application. A. J. Hall. *Textile Recorder* 65, No. 781, 54-6 (1948). A review of bleaching, dyeing, printing, and finishing developments in 1947.

3. Recording The Strength Of Scouring In Continuous Cloth Scouring. Ralph E. Hale (Bell Co., Worcester, Mass.) *Am. Dyestuff Reptr.* 36, 362-4 (1947). The strength of the scouring soln. is shown to bear a definite logarithmic relationship to the cond. A continuous cond. recorder is used to control the soln. strength in factory operation.

4. Recent Developments In The Continuous Bleaching Of Textiles. Thomas E. Bell (E. I. du Pont de Nemours & Co., Inc.) *Can. Textile J.* 64, No. 20, 44-6 (1947). See *Chem. Abstracts* 41, 4925i.

5. Continuous Bleaching Of Cotton Cloth. Georges Mairesse. *Teintex* 12, 410 (1947). A description of equipment used for continuous bleaching of cotton cloth.

6. Continuous Bleaching And Vat Dyeing Equipment. Edward S. Pierce. *Can. Textile J.* 64, No. 10, 52 (1947). Descriptive.

7. Williams Unit: Its Use In Textile Processing. S. H. Williams (General Dyestuff Corp., Charlotte N. C.) *Am. Dyestuff Reptr.* 36, 256-62, 274 (1947). cf. *Chem. Abstracts* 39, 3471[3]. A history of the Williams unit and diagrams showing where and how it may be

used and its advantages. Small liquid capacity, adaptability to high-speed continuous processing, and ability to function over a wide range of controlled temps. fit the unit for various steps in vat, direct color, S, and naphthol dyeing ranges. It can also be used efficiently for chem. treatment of poorly absorbent fabrics and for washing, scouring, and warp dyeing. Small lots can be handled economically and a small model makes a practical lab. machine.

8. Continuous Bleaching Of Textiles. Thomas E. Bell (E. I. duPont de Nemours & Co., Inc., Wilmington, Del.) *Fibre and Fabrics* **100**, No. 3242, 6-8; *Textile Bull.* **72**, No. 2, 42, 44, 46 (1947). Description of basic operations, temp. control and typical system.

9. Continuous Bleaching Accents Instrumentation. E. A. Murphy and R. Pollock. *Instrumentation* **2**, No. 4, 32-4 (1947). The continuous textile bleaching system and suitable devices for the close control of the numerous variables are described in detail, and a typical continuous bleaching range control panel is shown.

10. Continuous Pad-Steam Dyeing. A Survey Of Its Applications. Paul Meunier (E. I. duPont de Nemours & Co., Inc.) Wilmington, Del. *Can. Textile J.* **64**, No. 16, 41-2, 44, 46 (1947). The pad-steam continuous dyeing processes are compared with older conventional dyeing methods. Several modifications of the basic pad-steam process are desccribed together with their applications. The new processes facilitate the use of the desirable vat colors on cotton, rayon, and other fibers in mixed-fiber constructions.

11. Apparatus For Mercerizing Cotton Goods. Hans O. Kauffmann, Edward S. Shanley and Robert L. McEwen (To Buffalo Electro-Chemical Co.) U. S. 2,391,905, Jan. 1, 1946. (This title may be misleading—a method of continuous treatment is described in this patent.)

12. Wartime Advances In Continuous Bleaching. Dehaven Butterworth. *Can. Textile J.* **63**, No. 12 47-8 (1946).

13. Bleaching Speeded Up From Days To Hours. Kenneth H. Barnard. *Textile World* **96**, No. 12, 104-5, 208-10 (1946). A review.

14. Recent Developments In Textile Bleaching, Dyeing, And Finishing. A. J. Hall, *Textile Recorder* **63**, No. 756, 52-3, No. 757, 54, 56, 58, 62 (1946). A review.

15. Some Aspects Of Continuous Wet-Processing Of Textiles. R. H. Brereton (Wm. Lawrence Pty. Ltd.). *Textile J. Australia* **20**, 341-3 (1945). Scouring, bleaching, and dyeing are discussed.

16. Trends In Bleaching Cloth. J. Carlisle Farrow. *Cotton.* (Atlanta) **109**, 194-6, 134 (1945). Much less time is required for desizing than formerly and continuous desizing has been developed by making use of a large J-box or a continuous apron enclosed in a steam box.

17. Method Of Treating Textiles And Apparatus Therefor. U. S. #2,357,262, H. O. Kauffmann. Arrangement of heating goods by passing them through a J-type chute and from there through a second J-type chute. During the passage from the first to the second J-type chute, the goods are exposed to steam.

18. Method Of Heating Goods. U. S. #2,353,615, H. O. Kauffmann, E. S. Shanley. Method of heating goods after they have been piled into an open J-box.

19. Continuous Treatment Of Fabrics. Otto Eisenhut, Hanns Rein and Erich Schwartz (to I. G. Farbenind. A.-G.). Ger. 707,473, May 21, 1941. (Cl. 8*a*, 7). Addn. to Ger. 694,765 (*Chem. Abstracts* **35**, 5314). The continuous process for treatment of cellulose fibers outlined in Ger. 694,765 is applied to other fibers such as wool or cotton.

20. Apparatus For CSontinuous Purifying And Treating Of Breadths Of Fabrics. A. Schuster. German 707,529, May 21, 1941. *Chemical Abstracts* **37**, 2945 (1943).

21. Apparatus For Treatment Of Textile Fabrics With Heated Fluids, As In Steam Treatments In Scouring And Bleaching Processes. C. N. Poosl (to E. I. du Pont de Nemours & Co., Inc.) U. S. 2,304,474, December 8, 1942. Various structural, mech. and operative details.

22. Bleaching Materials Such As Regenerated Cellulose Rayon Thread. Alden H. Burkholder (to Industrial Rayon Corp.) U. S. 2,302,936 Nov. 24. An arrangement of app. is described, and a method is employed which involves continuously but temporarily storing the thread in the form of an advancing helix having a large number of closely spaced turns, treating the thread while in helical form with a bleaching soln. contg. a strong-acid-neutralized oxy-halogen salt of an alkali or alk. earth metal, the soln. having an available Cl content such that the time required for bleaching the thread is less than a minute, washing the bleached thread while in helical form without using an antichlor (the washing time being less than a minute) and drying the washed thread.

23. Apparatus For Dyeing, Washing Or Bleaching Cloth In Endless Rope Form. W. Milne, Jr. (to Joseph Bancroft & Sons Co.). U. S. 2,301,437, November 10, 1942. Various structural mech. and operative details.

24. Equipment For Continuous Steaming Of Textiles. A. P. Azn (to N. V. Maschinefabriek "Jaffa" v.h.L. Smulders & Co.). Ger. 723,626, June 25, 1942 (Cl 8*b*. 13.01).

25. Equipment For Continuous Steaming Of Textiles. A. P. Azn (to N. V. Maschinefabriek "Jaffa" v.h.L. Smulders & Co.). German 723,626, June 25, 1942. *Chem. Abstract* **37**, 5602.

26. Apparatus For The Continuous Treatment Of Cellulose Breadths With Alkali Liquor On Conveyors. Thuringische Zellwolle A.-G. and Walther Schieber. Ger. 729,340, Nov. 19, 1942 (Cl. 12. .6).

27. Continuous Treatment Of Fabrics. O. Eisenhut, Hanns Rein and E. Schwartz (to I. G. Farbenind. A.-G.). German 707,473, May 21, 1941. Addn. to German 694,765 (*Chem. Abstracts* **35**, 5314). The continuous process for treatment of cellulose fibers outlined in German Patent 694,765 is applied to other fibers such as wool or cotton. (German 694,765-July 11, 1940. A revolving table on which the newly spun cellulose web is picked up is described. The plate is perforated and the web is treated on it while it revolves slowly. Perhaps this is equiv. to U. S. 2,198,962 April 30, 1940). *Chem. Abstracts* **37**, 2945 (1943).

28. Washing, Desulfurizing, Bleaching, Finishing And Like Treatments Of Artificial Yarn. Alfredo Nai (to "Chatillon" Societa anon. italiana per le fibre tessili artificial). U. S. 2,131,409, Sept. 27. App. is described, and a process for the treatment of continuous threads of artificial yarns or filaments by liquids passing through a tube larger than the yarn comprising the steps of passing the continuous yarn through the tube and injecting under pressure a continuous stream of the treating liquid through the tube in a direction parallel to the direction of movement of the yarn the pressure being maintained throughout the tube so as to move the yarn through the tube in a longitudinal dairection and so as to keep the yarn taut. (*Chem. Abstracts*—1938).

29. Steaming Crepe Yarns Successfully. Joseph Brantwood. *Textile Recorder* **54**, 50 (Nov. 6, 1936). A crit. discussion of the different types of steamers and particularly of a new semicontinuous fully-automatic vacuum steamer. (*Chem. Abstracts*—1937).

30. Continuous Process Of Conditioning Fabrics Such As Cloth Or Paper By Treatment With Preconditioned Moistened Air. Alfred F. Karlson and Thayer Francis (to Parks-Cramer Co.). U. S. 1,992,753, Feb. 26. Various details of app. and operation are described. (*Chem. Abstracts*—1935)

31. Treating Textile Fibers, Threads And Fabrics With Liquids. Thomas W. Holt, Archibald S. Kilpatrick and John F. W. Stuart. Brit. 427,908 May 2 1935. The material to be treated with, e.g., a bleaching liquid is carried on an endless conveyor through a closed vessel contg. the liquid, a 2nd endless conveyor arranged above the 1st maintaining the material beneath the liquor and preventing it from floating off the lower conveyor. (*Chem. Abstracts*—1935).

32. Bleaching Of Textile Fibers, Threads, And Fabrics. Treating Textile Fibers, Threads And Fabrics With Liquids. Thomas W. Holt, Archibald S. Kilpatrick and John F. W. Stuart. Brit. 427,908, May 2, 1935. The material to be treated with, e.g., a bleaching liquid is carried on an endless conveyor through a closed vessel contg. the liquid, a 2nd endless conveyor arranged above the 1st maintaining the material beneath the liquor and preventing it from floating off the lower conveyor. (*Chem. Abstracts* 1935, p. 6771[8]).

33. Bleaching of Cotton, by Open Width Process. *Chem. Abstracts* 1934, p. 5675[8]. Continuous Open-Width Bleaching Process (for Cotton Fabric). Charles Sunder. Rept.

on R. Starek's Sealed Notes (A) No. 2145, 11, 1, 12, and (B) No. 2309, 14, 3, 14. *Bull. soc. ind. Mulhouse* 99, 632-5 (1933).—Sunder notes that A forms the subject matter of Ger. pat. 176,606 and adversely criticizes the app. described in B, which consists of a trunk having horizontal and inclined sections through which fabric is drawn while being successively subjected to desizing and bleaching treatments.

34. Bleaching of Textiles, Continuous Process for, *Chem. Abstracts* 1931, p. 1389[3]. Continuous Bleaching Process. N. V. Filippov and B. S. Voronkov. *Izvestiya Tekstilnoi Prom i Torgovli* 9, No. 1-2, 135 (1930): *Chimie & industrie* 24, 1943.—In the proposed bleaching process the usual scouring and boiling operations (which require 6-12 hrs.) are replaced by a relatively short (30-40 min.) treatment in open tanks with 3-4°—Be' NaOH contg. a wetting agent (soap, Na sulforicinate or ricinate, etc.) and alkali metal salts (Na silicate, Na and K sulfites, etc.): the goods are washed first with hot and then with cold water, and the bleaching is continued as usual by passing for 30 min. in a 0.2-0.5°—Be'. Ca hypochlorite soln., washing, acidifying, washing and drying. The strength and other properties of fabrics treated in this way are practically the same as when bleached in the usual way.

35. Bleaching, Continuous. *Chem. Abstracts* 1931, p. 1677[2]. Continuous Bleaching Challenges the Chemist. Winn W. Chase. *Textile World* 79, 636-7 (1931).—The need of chem. developments to keep pace with the mech. improvements is stressed.

36. Bleaching of Textiles and Apparatus Therefor. *Chem. Abstracts* 1930, p. 1228[8]. Apparatus and Manpulative System for Continuous Treatment of Textile Fabrics with Alkaline, Bleaching and Dyeing Liquors, Etc. William S. Rowley and Harry W. Butterworth, Jr. (to H. W. Butterworth & Sons Co.). U. S. 7,741,338, Dec. 31. Various details of construction and operation are described.

37. Bleaching Of Cotton Piece Goods In One Boil. *Chem. Abstracts* 1930, p. 6025[6]. Thomas F. Hughes. *Am. Dyestuff Reptr.* 19, 455-8 (1930).—Advantages in the use of the Allen Patent "Worcester" kier for the scouring and bleaching of cotton piece goods are discussed.

38. Bleaching, Continuous, Cold, Of Piece Goods. *Chem. Abstracts* 1929, p. 711[8]. A Continuous Cold Bleach for Piece Goods. Thomas F. Hughes, *Cotton* 92, 1231-2 (1928).—An illustrated description of the process is given.

39. Bleaching, Of Textiles. *Chem. Abstracts* 1927, p. 2562[4]. Continuous Process for Scouring and Bleaching Woven Piece Goods. Wm. Bennett. *Silk J.* 3, No. 32, 61-2 (1927).—Particular attention is given to piece goods contg. rayon. Formulas are given.

PEROXIDE

1. Buffalo Electro-Chemical Company, Inc., Becco Continuous Peroxide Bleaching Booklet, 10 pp. 1947 edition. (Technical Advertising). A descriptive booklet giving general information on the Becco system—the principle of its operation, the different methods used (rope bleaching or open-width bleaching), detailed description of the J-box, advantages to be had with the Becco system of continuous peroxide bleaching. A large drawing of the Becco Continuous Peroxide Bleaching Range is included.

2. A Guide For The Operation Of The Becco Continuous Bleaching Range. Becco Sales Corporation (Sales agents for the Buffalo Electro-Chemical Company, Inc.). A loose-leaf booklet, 37 pp., isssued in July 1947. Detailed directions for the operation of the Becco Continuous Bleaching Range for the use of bleachery personnel. Subjects discussed are as follows:

Assembly of grey goods
Speed of operation
Pretreatments
Saturation
Feeding of chemicals
Steaming
Washing
Care of the range
General

Much of the data is given in the form of tables, charts or graphs.

3. A Guide For The Installation Of The Becco Continuous Bleaching Range. Becco Sales Corporation (Sales agents for the Buffalo Electro-Chemical Company, Inc.). A loose-leaf booklet, 72 pp. issued in July 1947. A compilation of data intended to acquaint the textile trade with all phases of continuous bleaching from the selection of the J-box, through the installation stage up to the point of actual operation of a BECCO bleaching range. Detailed instructions are given regarding selection of the proper range (bleaching data, cloth production rate, chemical feed), instruments, J-box installation, suggested layouts for continuous bleaching, miscellaneous equipment (pipes, valves, fittings), saturators and washers. Much of the data is presented in the form of tables, charts and graphs.

4. Becco Continuous Peroxide Bleaching. Buffalo Electro-Chemical Company, Inc. 11-page booklet. (issued by the Company) 1947. Descriptive booklet on the process.

5. New Continuous Bleaching Unit. Anon. *Am. Wool & Cotton Reptr.* 61, #33, 20-21 (Aug. 14, 1947). A short article on the operation of the Becco Continuous Bleaching unit at Lewiston, Maine (Pepperell Mfg. Co.). Six photographs and a sketch are included. Advantages of the system are discussed.

6. Fabric Finishing. Richard W. Powell. *Textile Bull.* 71, No. 4, 48, 50, 52, 82-3 (1946). An address reviewing a continuous peroxide bleach, pigment dyeing, and finishing machinery.

7. Some Aspects Of Peroxide Bleaching. I. W. J. MacNab. *Fibres, Fabrics & Cordage* 12, 487, 489, 491, 509 (1945). II. *Ibid.* 13, 16-19 (1946). A discussion of the manuf. of H_2O_2, bleaching with H_2O_2, versatility of peroxide bleaching, a bleaching installation, a detailed recipe for bleaching cotton and linen yarn, piece bleaching of linen and cotton with peroxide, control of the peroxide bath, expts. in bleaching linen piece goods, the continuous peroxide bleaching process, American practice, and jute bleaching. Conclusion: The ever-increasing use of H_2O_2 in bleaching has justified the claim that it is safe and cheap to use and gives results unequalled by any other method.

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9. Continuous Open-Width Peroxide Bleaching. W. W. Chase. *Textile World* 94, No. 1, 76-7 (1944). Illustrated description of an installation of this process which has resulted in uniformity of treatment, saving in chem. costs, and reduction of manpower requirements. *Chem. Abstracts* 38, 1372 (1944).

10. Continuous Peroxide Bleaching. Anon. *Am. Dyestuff Reptr.* 33, 345-6, 365-8, 380, 385-8, 401-2, 405-7 (1944). A series of four articles on developmnet, operation, equipment and adaptability of the Buffalo Electro-Chemical Company's continuous bleaching process.

11. Procedure and Equipment For Bleaching Cotton Goods With Peroxide By The Continuous Method. D. J. Campbell. *Am. Dyestuff Reptr.* 33,, 293-8 (1944). This is a report on the process with data used in its development. *Chem. Abstracts* 38, 6570 (1944).

12. Continuous Peroxide Bleaching. Buffalo Electro-Chemical Company, Inc.—Technical Staff. *Am. Dyestuff Reptr.* 33, 345-6, 365-8, 380, 385-8, 401-2, 405-7 (1944). Part I—Its Development. Part II—Operation. Part III. Equipment. Part IV—Its Adaptability.

13. Improvements In Continuous Peroxide Bleaching. H. R. Mauersberger. *Rayon Textile Monthly* 24, 144-5 (1943). Two processes are described in which the cloth in rope form is impregnated with alk. H_2O_2, passed through a heated J-shaped piler, and then rinsed. In one process the cloth is scoured in a similar sequence of machines before bleaching.

14. Continuous Peroxide Bleaching. Dehaven Butterworth, *Textile World* 93, No. 12, 78-9 (1943). Illustrated descriptions of open-width continuous bleaching processes. Herringbone twill and other army fabrics can be bleached at a speed of 125 yds per min., while lightweight fabrics can be processed at speeds as high as 150 yds. per min. *Chem. Abstracts* 38, 1372 (1944).

15. Hydrogen Peroxide, Manufacture, Shipping And Use. J. H. Hubel, *Can. Chem. Process Inds.* 27, 392-4 (1943). Continuous peroxide bleaching of cotton textiles is mentioned. *Chem. Abstracts* 37, 5833.

16. Continuous Pfroxide Bleaching. R. E. Rupp. *Am. Dyestuff Reptr.* 31, 638-40 (1942). A desription and comparison of processes developed by duPont and Buffalo Electro-chemical Company in the Piedmont area.

17. Peroxide Bleaching. H. G. Smolens. *Am. Dyestuff Reptr.* 30, 579-80 (1941). A discussion of the progress made in the past two years on the continuous peroxide bleaching process. *Chem. Abstracts* 36, 1782 (1942).

18. Continuous Peroxide Bleathing Unit At Renfrew Bleachery. Anon. Sept. 1941. This article is cited in reference No. 3. A more complete reference is not available.

19. Continuous Peroxide Bleach. Anon. *Textile World* July 1, 1941. This article was cited in reference No. 3. A more complete reference is not available.

20. Continuous Bleaching Of Cotton Goods. *Chem. Abstracts* 1939. N. I. Kuzub. Russ. 46,871, May 31, 1936. The fabric is satd with H_2O_2 treated with hot dil. solns. of alkali or alk. earth hydroxides or with aq. soln. having an alk. reaction, such as Na_2CO_3 silicates, fatty or resinous soaps, etc., in the presence or absence of a stabilizer and neutral salts.

21. Scouring And Bleaching Materials Such As Wool. Lindsey H. Mason, U. S. 2,070,210, Feb. 9. The material is continuously moved through a bleaching bath primarily consisting of an alk. H_2O_2 aq. soln. of a temp. of about 38-55° and is removed from the bath after a short time (suitably about 1-5 min.), squeezed to remove surplus soln., and rinsed. App. is described. *Chem. Abstracts*—1937.

22. Ger. 253,929 Oct. 4, 1910. Addition to 202,629. F. Ringenbach. Continuous Bleaching Process, with details of app.

23. Ger. 246,205, Aug. 30, 1910. S. Krosnowski. App. for the continuous treatment of cotton goods in an opened-up state, as dyeing, steaming, barrelling, bleaching, and impregnating.

24. Ger. 235,130, Feb. 16, 1908. Fr. Gebauer. App. for continuous scalding, bleaching, and dyeing of textile in an air- and steam-tight closed chamber, provided with built-in U-formed filling funnels, surrounded with revolvable rollers.

25. Continuous Boiler. E. Ringenbach. Ger. Pat. 202,629. The textile is drawn through the treating soln. in continuous rope form on revolving laths. Processes of boiling, steaming and gas-action can be carried out on the textile by taking up so large a stock. The textile can be conveyed from here to continuous rope bleaching by a further app. *Jahresberichte uber die Leistungen der Chemischen Technologie* 1908 II, 386-7.

26. Process of Bleaching Textile Fabrics. Brit. 8,435, Apr. 7, 1906. Eugene Ringenbach, Remiremont (Vosges), France. Process of bleaching textile fabrics consisting essentially in passing them continuously without stoppage from the singeing to the boiling device, and in the same manner from the boiling to the drying device the series of washing, acid, and bleaching baths, dipping repeatedly into each bath, for each dipping repeatedly squeezing and guiding to the next dip through the air on a log way, and the modification, in which the boiler is arranged so that it takes part in the continuous operations and the fabric passes uninterruptedly from the singeing to the drying operations.

(To be continued)

Membership Applications

(Additional applications on Page P661)

Justus Hoyt—Manager, Pigment Dispersions Dept., Warwick Chemical Co., Long Island City, N. Y. Sponsors: D. J. Eccleston, I. S. Hurd.

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New England Industrial Wastes Conference—

RECOVERY OF GREASE FROM WOOL SCOURING WASTE AND ABATEMENT OF STREAM POLLUTION THROUGH THE CALCIUM HYPOCHLORITE PROCESS*

ALEXANDER A. CAMERON
Vice-President—Abbot Worsted Company

The author presents his views on the Calcium Hypochlorite Process as an aid in grease recovery and abatement of stream pollution.

The material is handled in three parts: (a) a history of the installation of the Treatment Plant at Abbot Worsted Company's Forge Village scouring plant, (b) a resume of the process and (c) a presentation of the author's experiences with the process and comments on the same.

NOT being a scientist, a chemist, or a technical expert—any remarks which I present to you are clothed in the language of a layman and are based on practical experience and application of a treatment process known as "The Calcium Hypochlorite Process."

HISTORY OF TREATMENT PLANT INSTALLATION

Our scouring plant at Forge Village, Mass., is located on Stony Brook with its source of water, Forge Pond. A dam at the head end regulates the flow of water and pond water level in the pond. Almost all water used for manufacturing purposes comes from this source and, for the summer months in particular, the only water emptying into the stream is waste water from manufacturing purposes. A mile and a half down the brook is located our Graniteville Plant. A dam above the plant forms Graniteville pond and that in turn supplies our manufacturing water. Our main office is located directly on the edge of the pond—likewise, C. G. Sargent's Main Office, with their manufacturing plant on the downstream side of the dam.

Prior to the war we had scoured mostly carpet wools, mohair and light grease content wools, and had not encountered too much difficulty with pollution problems. In 1941 and 1942, however, when we not only stepped up our scouring production but commenced scouring wools of high grease content, our troubles really began to commence.

The pond at Graniteville soon became a veritable open sewer. Any fish in the pond rose to the surface gasping for air and soon there were masses of dead fish floating on the pond surface. The stench in our Main Office was almost unbearable at times (likewise in our Graniteville Plant) and our very good friends and neighbors, C. G. Sargent and Sons across the pond, were on the point of being driven out of their own quarters.

We built lagoons to hold back the waste water but that in turn soon overflowed into the stream and we had the same problem over again—not only at Graniteville, but also at Forge Village. We employed steam shovels to keep the stream clear and also to build additional lagoons. Something had to be done quickly or our own plant and possibly that of our neighbors would soon have to be shut down.

After considerable investigation and study it was decided to consider a Calcium Hypochlorite Treatment Process as developed by Joseph Campanella and Daniel Townend of The Fields Point Manufacturing Company, Providence, R. I. We engaged Paul Howard of Whitman and Howard as our consulting engineer.

In 1943 we set up a pilot plant and ran it during the summer months. The plant showed satisfactory results and in 1944 plans were finally formulated and put into operation.

The Treatment Plant commenced operation in July 1945.

PROCESS RESUME

Our scouring waste water is collected in a sump pit or pump house, located approximately one-hundred yards outside our wash room. From here it is pumped to our Treatment Plant and into a so-called aeration tank, where it is thoroughly mixed and treated with calcium hypochlorite. It requires approxi-

* Presented at New England Industrial Wastes Conference, Massachusetts Institute of Technology, June 27, 1950.

mately 6-7% by volume of calcium hypochlorite for treatment. Up to 200,000 gallons of scouring liquor are treated per week. The pH of the scouring liquor before treatment is approximately 8-11 and after treatment, 7-8. The scouring liquor is then settled in three tanks of 15,000 gallons capacity each, the settling period being approximately eight hours, and both the grease and sludge are precipitated to the bottom of the tank. The clear liquor is then decanted off into the stream.

The sludge at the bottom of the tank is pumped to three other settling tanks, where it is treated with sulfuric acid to bring it down to a pH of approximately 4.5. Another settling process follows, this time of shorter duration, and the clear liquid is again decanted into the stream.

The sludge is heated and pumped to a blowdown tank from which it is forced through Sperry filter presses. The grease which is recovered is sold to help defray the expenses of the Treatment Plant, and the press cake, which is left in the press, is carted away and dumped in some out of the way place.

The grease is a good grade of common degras and, although we have sent many samples of the press cake away to rendering companies, it has not as yet been accepted as satisfactory for fertilizer.

DISCUSSION

The two questions most commonly asked about the process are:

(a) *What has it accomplished?* and (b) *Will the process pay for itself?*

Regarding the first question, we can truthfully say that our stream has been cleared up. Although the effluent which is decanted and returned to the stream is theoretically chemically pure, the best which we have ever accomplished, under the most favorable set of conditions, is a 90% B.O.D. removal. For the most part the B.O.D. removal will average nearer 70 or 75%.

However, the objectionable odor has disappeared from the Graniteville pond and stream. The water is fairly clear but with a yellow cast, somewhat similar to the color of the effluent which is decanted from the settling tank. Fish have returned to the stream and wild life to the surrounding area. The Graniteville pond is now full of fish and we are told that they run considerably larger in size than ever before. We have seen fish at the head of the stream just outside our pump house. We do know that many fish are caught from the pond and eaten by the ones who catch them. Up to date, as far as we know, there have been no disastrous results.

There is one point about a treatment system which we consider very important and should be emphasized very strongly. Whereas the effluent being emptied into the stream is theoretically pure, the press cake and sludge residue likewise should be fairly stable or sooner or later this in itself will create another nuisance and polluted area. For example, our press cake is stable and we can dump it anywhere with no disastrous results. Although an odor of chlorine persists for a short time, it does clear up and the pile of sludge or cake remains stable. We have used it to fill up holes around our Village and, among other things, have found it a very good base for a hockey rink.

As to the second question, "will the process pay its own way?", this is a somewhat difficult question to answer since there are so many variable factors involved. We do know that with degras selling at 10c per pound and with a large enough production of wools with sufficiently high grease content going through, the process has shown a profit.

For example, in the Fall of 1946, with a scouring production of 275/300,000 lbs. of stock a week, we were reclaiming enough grease to be ahead of all expenses. However, with wools of light grease content, one is really licked before he starts and there is no theoretical possible amount of grease to make the process anywhere near pay for itself. Much to our sorrow, we have found this to be our worst headache, since we scour considerable weights of mohair and wools of light grease content such as S. A. 4s, 5s and Domestic 50/56s.

The process at best is a very expensive process to operate because the cost of chemicals is no small matter. To repeat and emphasize once more, to make the process pay there must be plenty of natural grease available in the wool and, based on present day conditions, the price of degras must be kept at about 10c per pound.

Another factor which is very detrimental to the recovery of wool grease is the inefficiency of the pressing operation. There is always a considerable amount of grease left in the cake. The best we've done is 14% of grease left in the cake; generally it averages somewhere between 20 and 30%. Our figures show that we actually remove from the pressing operation up to 5000 lbs. of dry sand per day, so it is easy to see where most of our grease is going and why it is so difficult to run the process economically.

All kinds of suggestions and ways to extract the grease from the cake have been tried but so far we have never been able to find the answer. A solvent extraction of the cake will remove the grease but this will be an expensive process to install and, up to date, we have not wanted to go into it.

By way of further comment, we have encountered serious problems of corrosion and ventilation. Proper ventilation has been accomplished by the installation of wooden ventilating shafts with wooden hoods over many of the tanks. This has been a fairly simple answer and has worked out very satisfactorily. The corrosion problem on all steel works and iron or metal fittings has been eliminated by the use of a noncorrosive primer paint, followed by a rubber base paint as a second coat. Results from this have been very good indeed.

We have also found that the sooner the scouring liquor is treated with the calcium hypochlorite, the better results obtained. For example, the first two bowls of each scouring train are equipped with automatic dump valves which furnish a steady flow of scouring liquor to our pump house. In this way the scouring liquor is collected before it really has much chance to go septic. A small amount of calcium hypochlorite is added in the pump house which preserves the liquor from further deterioration.

By using this treatment early, we not only save on the amount of calcium hypochlorite used, but also find the liquor a little easier to crack and our grease removal a little higher with the quality a little better. At least the free sulfur content has been kept considerably lower.

In connection with grease recovery, a very serious problem has just arisen. At the Reciprocal Trade Agreement meeting to be held in England this Fall, wool grease and lanolin are on the list of items to be discussed. It would be a calamity and a tragedy to our wool scouring industry here to have the tariff on wool grease reduced. Lowering of such tariff is bound to create even greater problems than already exist in the national, state and local effort to encourage stream clarification. This is due to the fact that as the economics involved in the operation of such treatment plants become more unfavorable, the more cheaply can wool grease be brought into this country.

CONCLUSION

Our Treatment Plant was born through necessity. The process is a settling process, using calcium hypochlorite as the agent. Although the process is an expensive one, under the proper conditions, with the price of wool grease favorable and the percentage of grease in the raw wool sufficiently high, the process will carry its own weight. We have encountered many pitfalls and have had many headaches, but from a practical point of view, at least, our stream has been cleared up.

New England Industrial Wastes Conference—

WASTES TREATMENT IN COTTON FINISHING PLANTS*

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GENERAL CONSIDERATIONS

The term "finishing" covers a large number of processes producing wastes of varying character, and the number is increasing constantly with the development of the industry. Chief among these are kier treatment or caustic saturation, bleaching with peroxide or hypochlorite, "souring" to neutralize caustic or chlorine, mercerizing, shrinkproofing, dyeing, soaping, and many processes which impart special qualities and appearances to cotton cloth. Since many or most of these processes are usually carried on at a finishing plant, the treatment of the wastes from individual processes will not be considered in this paper. The character of the wastes from individual processes, however, has an important bearing on general treatment methods.

VOLUME OF WASTES REQUIRING TREATMENT

The cost of treatment, by any but the crudest methods, is generally high enough to be of serious concern to the industry, and warrants any feasible measures to effect economies by reducing the volume of wastes to be treated. This may be done by the re-use of lightly contaminated waste waters, and by control of water waste. Of paramount importance, however, is the separation from wastes requiring treatment of those wastes light enough in polluting constituents to permit their discharge to a receiving body of water without treatment.

Such a separation requires a knowledge of the volume and character of the receiving water, the antipollution standards established for it, and the volume and character of the lighter process wastes. Such separation cannot be made solely on the basis of B.O.D. or suspended solids content; cotton finishing processes yield both acid and alkaline wastes, and it may be necessary to divert certain process wastes, light enough by B.O.D or solids content to require no treatment, to the treatment plant because they contain the requisite amount of acid to produce the optimum reaction in the wastes combined for treatment.

Character of Wastes:

Cotton finishing process wastes vary widely in character. From the standpoint of treatment, however, these variations are mitigated by two facts:

1. Good management of the finishing industry dictates that no significant volumes of concentrated industrial chemicals be discharged to waste. Wastes treatment is more generally concerned with the relatively dilute wash-waters resulting from the removal of these chemicals from the cloth. An important exception is kier liquor and its counterparts.
2. Cotton finishing process wastes consist of both acid and alkaline components, which tend to neutralize each other.

CONCENTRATED PROCESS LIQUORS—Table I, illustrating some of the principal concentrated process liquors, indicates their diversity in chemical character.

As stated in (1) above, these concentrated process liquors are generally discharged directly to waste only in small volumes by accidental spillage or at change-over in processes, except in the case of kier liquors or their counterparts. Kier liquors are discharged in considerable volume, and constitute a major component of the pollution load from cotton finishing plants. The other concentrated process liquors are discharged in dilute form after being washed from the cloth.

TYPICAL DISCHARGED WASTES—The literature frequently classifies the components of cotton finishing wastes as typical "bleach house," "dye house," "mercerizing" wastes, etc. Such classification serves no useful purpose in a paper of general scope, especially since there are so many specialized processes—and many variations of these processes—which are not "typical," and do not fall readily into a simple classification.

Combined cotton finishing wastes will have *approximately* the character listed in Table II.

From Table II it will be seen that average combined wastes are strongly alkaline, highly turbid but relatively low in settleable suspended solids, and have a B.O.D. somewhat less than domestic

TABLE I
CHARACTER OF CONCENTRATED PROCESS LIQUORS

		Parts per Million				
Process Liquor	*pH*	*B.O.D.*	*Oxygen Consumed*	*Suspended Solids*	*Alkalinity*	*Acidity*
Kier Liquor:						
Caustic	11.8	5,000	5,000	350	14,000	0
Peroxide	10.5	—350**	600	50	1,200	0
Saturators:						
Caustic	11.5	2,500	8,000	1,500	50,000	0
Peroxide	10.5	—2,000**	600	150	3,000	0
Bleaching "Chemic"	9.8	450*	125	300	3,800	0
Acid "Sour"	1.5	25	200	200	0	7,500
Cloth Scour	10.0	6,700	4,500	2,200	4,800	0
Starch Mangle	7.3	600	10,000	65,000	150	0
Dye Liquor	11.7	200	250	150	2,000	0
Mercerizer	12.0	100	350	50	10,000	0

* After neutralization of 1,750 ppm average free chlorine ocntent.
** Without neutralization of peroxide.

*Presented at New England Industrial Wastes Conference, Massachusetts Institute of Technology, June 27, 1950.

TABLE II
AVERAGE ANALYSIS OF COMBINED COTTON FINISHING WASTES

	Parts per Million
Color	Distinct—varying shades
Turbidity	125
Oxygen Consumed	300
pH	9
Alkalinity, Total	500
Alkalinity, Hydroxide	100
Alkalinity, Carbonate	400
Alkalinity, Bicarbonate	0
Biochemical Oxygen Demand	175
Total Residue on Evaporation	1,700
Total Suspended Solids	100
Total Dissolved Solids	1,600
Total Mineral Residue	1,200
Suspended Mineral Residue	20
Dissolved Mineral Residue	1,180
Settleable Solids, % in 1 Hr.	0.25

sewage. Because of the inhibiting chemicals they contain (e.g., acid, caustic, hypochlorite, peroxide, etc.) they are bacteriologically sterile—in fact, even after mixture with sewage from plant toilets, the combined wastes are generally sterile. They will vary in character from hour to hour throughout the day, sometimes having no hydroxide alkalinity, but rarely if ever being acid.

Separation of light wastes, for discharge without treatment to the receiving water, will result in combined wastes, remaining to be treated, having proportionately higher pH, B.O.D., alkalinity and suspended solids than shown in Table II. By separating only the light wastes of an alkaline reaction, the remaining combined wastes may have a correspondingly lower pH and alkalinity.

TREATMENT

SEPARATION AND ELIMINATION

OF LIGHT WASTES—Separation depends primarily upon the chemical character of the individual process wastes and upon the requirements of the receiving water, but there are other important considerations:

1. No separation should depend upon the manipulation of controls by operating personnel, except in special cases. That is, if a machine produces heavy wastes during part of its operation and light wastes during another, it is rarely feasible to provide connections from the machine to separate sewers and to depend upon the operator to discharge the two types of wastes to the proper sewers. In other words, the disposal of the wastes from any piece of equipment must generally be based on the character of the *strongest* wastes discharged.
2. The cost of separation may not be economically justified: it may be cheaper to treat the lighter wastes with the heavier ones.

EQUALIZING AND SUBSIDING BASINS—The wide and rapid variations in the chemical character of cotton finishing wastes make equalization desirable as the first step in any method of treatment; and since basins must be provided to furnish equalizing storage, they may as well be designed as subsiding basins, even though the removal of suspended solids from cotton finishing wastes by plain subsidence is low in comparison to domestic sewage.

Racks or coarse screens should be provided to remove the inevitable pieces of cloth in these wastes.

Kier liquor is generally discharged intermittently, and because of its exceedingly high B.O.D. and alkalinity, its rate of flow to the combined wastes sewer should be equalized by storage, prior to the general equalization of flow provided later in the subsiding basins. In small treatment plans of the draw-and-fill, or batch treatment type, such equalization is unnecessary.

Equalization by mixing and storage not only eliminates extremely high or low contents of many of its chemical constituents, but the resulting inter-reactions of components may have the following effects:

1. In rare cases it may be possible to reduce the pH sufficiently to cause precipitation of some of the constituents, thus increasing sedimentation of suspended solids.
2. Unusual odors may be liberated.
3. Unpredictable B.O.D.'s of the combined wastes may result from the dilution, neutralization, or release of chemicals inhibitory to biological life. Analyses of the discharge of various processes have indicated that the B.O.D.'s of some wastes increase with dilution.

CHEMICAL NEUTRALIZATION — Mere elimination of excess alkalinity of wastes may suffice under the following conditions:

1. Where the wastes are to be discharged to a receiving water or low sanitary classification.
2. Where the wastes are to be discharged to a municipal sewerage system and be combined with domestic sewage for biological treatment and where the ratio of volume of wastes to sewage is relatively large.

Under either of the above conditions, equalization by storage is desirable.

In small plants it may be most practical to operate on a batch system, each batch being manually treated after adequate chemical tests.

In all but small plants, continuous-flow treatment will be most practical, with the neutralizing chemical applied automatically, proportional to flow and pH of the wastes, by pH recorder and controller equipment.

In general, the most economical acid to use for neutralization is sulfuric acid. Local conditions may favor other chemicals, however. The use of boiler flue gases may be practical in some cases.

CHEMICAL PRECIPITATION — This method consists of the addition of a coagulant such as aluminum sulfate, ferrous sulfate, or ferric chloride, plus the requisite acid or alkali to produce the optimum pH for coagulation, followed by clarification by subsidence and decantation.

This method is more feasible in small installations of the fill-and-draw, or batch type, than in the continuous-flow type of plant, due to the constantly changing character of the wastes. The continuous-flow type of plant requires constant attendance and supervision by skilled personnel: the attendance required for plants of the fill-and-draw type may be reduced in frequency by enlarging the capacity of the treatment tanks.

Instrumentation will insure the maintenance of constant rate of coagulant dosage, proportional to the flow of wastes, and will maintain a constant pH by the control of corrective acid or alkali dosage. But only laboratory experimentation can determine the kind and optimum dosage of coagulant, and the optimum pH for coagulation. These variables may change continuously throughout the day, and present one of the principal objections to this method of treatment.

The volume of sludge from this method will be great—in some cases as much as twenty times that from plain subsidence.

BIOLOGICAL TREATMENT METHODS

Trickling Filters:—Of the available methods of biological treatment, the trickling filter is the one most adaptable to

combined cotton-finishing wastes because of its ability to maintain a reasonably constant degree of purification with wastes of varying character.

Long experience with a trickling filter operating at 1.5 M.G.A.D.* with intermittent dosage, handling combined heavy finishing wastes and mill sewage which have been subjected to primary sedimentation without neutralization, indicates that the following average results can be expected.

1. Effluent color consistently light brown, regardless of influent.
2. Influent pH of 10.5 reduced to 8.5.
3. Suspended solids reduced 10% to 25%, averaging 15%, without any secondary subsidence.
4. B.O.D. reduced 35% to 65%, averaging 50%.

Trickling filters of this type "unload" their accumulated bio-decomposition end products and the biological life which is resident in them, at least twice annually and sometimes more frequently, hence secondary subsidence is necessary.

The modern high-rate trickling filter, dosed continuously at rates many times those of the intermittently dosed type, has made possible such economies in the treatment of domestic sewage that its use in industrial wastes treatment would be a distinct advantage.

Pilot plant experiments by the writer at a New England mill during 1946-7*(1)* indicated that combined cotton finishing wastes and mill sewage could be treated on high-rate trickling filters at a rate of 10 M.G.A.D., without chemical neutralization, with the following average results:

1. Effluent color consistently light brown, regardless of influent.
2. B.O.D. reduced 40% to 65%, averaging 50%.
3. Occasional periods of caustic alkalinity handled without injurious effects—caustic alkalinity converted to carbonate or bicarbonate.

In the foregoing experiments, the ratio of applied wastes to recirculated wastes varied from 1 : 1 to 1 : 2.

Pilot plant experiments were conducted by Coburn during 1948 at a Pennsylvania mill*(2)* with combined cotton finishing and printing wastes, neutralizing the alkalinity with sulfuric acid. The high-rate trickling filter was dosed at rates varying from 5 to 18 M.G.A.D. with recirculation ratios varying from 1 : 3 to 1 : 22, and biological growth was aided at the start by the addition of a small dose of nitrogen and phosphorus to the filter influent. The following results were attained:

1. Color reduced to a slight gray-yellow.
2. B.O.D. reduced from 51% to 90%, the reduction varying directly with the recirculation ratio.
3. Suspended solids were reduced from 33% to 82% by the filter and secondary subsiding basin, the reduction here too varying with the recirculation ratio.

At the Mansfield Bleachery at Mansfield, Mass., a high-rate trickling filter was designed by Haley & Ward, and placed in service in 1949. This plant is scheduled for inspection by this Conference. It treats approximately 1.25 M.G.D. of wastes, and consists of the following components:

1. Segregation: separate sewers for the heavy alkaline wastes and the light but acid wastes.
2. Primary clarification or subsiding basin for the heavy, alkaline wastes.
3. Storage or holding tank for light, acid wastes.
4. Mixing tank for neutralization of heavy, alkaline wastes by controlled addition of light, acid wastes, followed by mixing by aeration.
5. High-rate trickling filter 70′ in diameter.
6. Secondary clarification.

The results of operation*(6)* to date show that with wastes having an average B.O.D. of 250 ppm and pH of 11.0† applied to the trickling filter at a rate of approximately 9.0 M.G.A.D., and with a recirculation ratio of 1 : 1, the overall B.O.D. reduction averaged 85%. Biological action in the filter is aided by the addition of nitrogen and phosphorus, the nitrogen/B.O.D. ratio being maintained at 1 : 20.

Intermittently-Dosed Sand Filters:—Where a high degree of purification is required, intermittent sand or other fine-media filters are effective. Filters of this type, operating at rates varying from 40,000 gals. per acre daily with primary clarification effluent to 400,000 gals. per acre daily with trickling filter effluent, will produce an effluent of the following quality:

1. Color—very low.
2. Turbidity—lor or absent.
3. Suspended Solids—none.
4. B.O.D.—Less than 10 ppm.

Filters of this type are comparatively expensive to construct and maintain.

MISCELLANEOUS BIOLOGICAL PROCESSES—The activated sludge process and other contact-aeration processes have been used in the treatment of many diverse types of wastes, and it is likely that they will be successful in treating certain types of cotton finishing wastes.

CHOICE OF TREATMENT METHODS—It is frequently stated in the literature that in this country the most common method of treatment of this class of wastes is by chemical precipitation and sedimentation*(3) (4) (5)*. Biological methods have generally been relegated to a role supplementary to chemical precipitation.

In those cases where only one or a few process wastes liquors require treatment, chemical treatment may be the only feasible method; and chemical treatment for partial neutralization of excess alkalinity may be a requisite for discharge of wastes to a municipal sewage treatment plant. But for combined wastes, especially if they include the sewage from mill toilets, biological treatment will prove the most economical and practicable; and of the available biological treatment methods the high-rate trickling filter—with or without prior neutralization of the wastes—is generally the best. Intermittently dosed fine media filters have no peer where a high degree of purification is required, although relatively expensive to operate.

The principal argument in favor of trickling filters is their lower cost of operation, due to their ability to handle wastes of widely varying character with a minimum of attention and control, and the absence of charges for chemicals. This argument is of particular interest to stream-pollution control agencies, since the more fool-proof the treatment plant, the less policing is required by the agency. In the case of chemical treatment plants, there is a very natural tendency in times of business recessions to economize by reducing skilled operating personnel, and by reducing the quantities of treatment chemicals used, to the detriment of treatment plant efficiency.

The most important rule to follow in the choice of a treatment method is that no choice should be made without pilot plant experimentation.

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(4) J. C. Geyer, "Industrial Wastes—Textile Industry". *Ind. & Eng. Chem.* 39. No. 5, May 1947.

(5) C. R. Hoover, "Treatment of Liquid Wastes from the Textile Industry". *Ind. & Eng. Chem.* 31. No. 11. November, 1939.

(6) Haley & Ward, Consulting Engineers, Boston—Private communication.

* Million gallons per acre daily.

† Raw wastes, before neutralization.

AMERICAN DYESTUFF REPORTER NEWS

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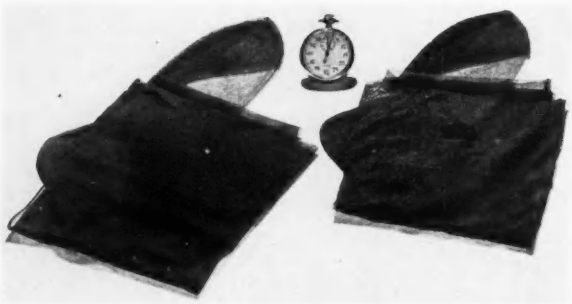


Absorption Effects of Bick Finish on Nylon

Equal droplets of water are absorbed (a) after three minutes on the untreated stocking on the left and (b) in 25 seconds on the treated stocking.

• New Nylon Finishing Process

A new finishing process, reported to give nylon warmth, softness and faster absorption and dispersion of water or perspiration, without impairing any of the fast-drying, long-wearing characteristics has been announced by Hans C. Bick, Inc., manufacturing chemist and fabric finisher of Reading, Pa.

The "nylonizing" finish, applied to the after finish of nylon, becomes permanent in both the finish bath and set with the temperature of boarding and drying, it is reported. It is manufactured from type 8 nylon, emulsified at the Bick plant and made water soluble.

The only change in appearance of the nylon is a dulling effect, according to Robert S. Horn, Jr., Vice-president in charge of manufacture, but the change in feel and touch is radical. A softness and pliability are produced, and since it absorbs water readily, the uncomfortable feeling of stickiness or clamminess is said to be eliminated. In cool weather, it reportedly does not become hard or tight. The finish is fused or bonded in the curing process to prevent washing out or wearing off, thereby giving permanence to the life of the fabric.

The finish is made available either as a finished processing job, or as a raw material.

• Plans for 21st Annual TRI Meeting Near Completion

The largest attendance in the history of the Textile Research Institute is anticipated for the 21st Annual Meeting, November 16-18 at the Waldorf-Astoria Hotel, New York. Ephriam Freedman, Director of Macy's Bureau of Standards, and Chairman of the Annual Meeting Committee recently announced that plans are nearing completion.

The technical sessions will be held on Thursday, Nov. 16. Speakers will include: Professor E. R. Schwarz of Massachusetts Institute of Technology; Harold J. Walter, President, Bachmann Uxbridge Worsted Corporation; Dr. George H. Fremon of Carbide and Carbon Chemicals Corporation; Dr. H. R. R. Wakeham of Textile Research Institute and L. W. Rainard of Alexander Smith and Sons Carpet Company. The talks will cover topics of present day interest, such as new concepts of yarn geometry, the dyeing of "Orlon", advances in the technology of Dynel, rupture properties of cotton fibers and the role of fiber crimp in carpet processes. In addition to the above, two distinguished British scientists will speak. J. B. Speakman, Professor of Textile Industries, Leeds University, will discuss "The Plasticity of Wool—Its Theoretical and Practical Significance" and Professor William E. Morton of Manchester College of Technology will discuss "The Spinning Value of Raw Cotton".

The President of the Institute and guest speakers will discuss topics of general interest to the textile industry on Friday, November 17th. The luncheon speaker will be Floyd W. Jefferson, President, Iselin-Jefferson Company. Other speakers will include George P. Fulton, in charge of research, National Institute of Cleaning and Dyeing; J. B. Goldberg, Research Director, J. P. Stevens and Company, Inc.; Giles E. Hopkins, Director of Science and Technology, The Wool Bureau and George H. Johnson, General Manager, American Institute of Laundering.

On Saturday, November 18th, Open House will be held at the Laboratories of the Institute in Princeton, New Jersey.

• New Addition to Emkay Plant

Emkay Chemical Company has approved architect's plans for an addition to their Elizabeth, New Jersey plant. New construction will provide space for the latest type manufacturing equipment and for new offices, it is reported.

Emkay manufactures specialties for the textile, leather and paper trades.

• Foxboro Announces Two Office Openings

The Foxboro Company, Foxboro, Mass., has brought its total of domestic offices to 39 with the opening of two new branch offices at 214 W. 10th St., Wilmington 1, Del. and 225 S. 5th St., Minneapolis 2, Minn. The former is under the managership of Kenneth L. Barton, a 25-year man with Foxboro. Robert C. Cahill heads the Minneapolis post as Resident Engineer.

Foxboro interests have been represented for many years in the St. Paul-Minneapolis area by a local firm of engineers, but a mounting volume of business is reported to have prompted the opening of a full-scale branch office and the transfer of Mr. Cahill from the Appleton branch.

Three of the Company's 39 offices include branch factory facilities.

• Improved Method for Size Preparation and Storage

Provisions for overcoming lumpiness and stagnation by constant agitation and heating of sizing mixtures highlight an improved method for preparing and storing of size. U. S. Patent 2,516,884, recently granted to George J. Kyame, a textile engineer at the Southern Regional Research Laboratory of the Bureau of Agricultural and Industrial Chemistry, New Orleans, La. describes the technique under the title "Method of and Apparatus for Preparation and Distribution of Sizing Materials." Copies are obtainable at 25c each from the U. S. Patent Office, Washington 25, D. C.

The apparatus includes a storage tank, a pump, a simple heat exchanger, and a size box so connected that the pump withdraws fluid simultaneously from the bottoms of the size box and storage tank and forces it through the heat exchanger. The discharge from the heat exchanger divides into two high pressure streams, one going back to the storage tank nad the other to the size box. By properly locating the return streams, a vigorous agitation of the tank contents is maintained without the use of conventional paddle or propellor-type mixers.

The patent is available for licensing on a royalty-free, nonexclusive basis. Applications should be addressed to the Bureau of Agricultural and Industrial Chemistry, U. S. Dept. of Agriculture, Washington 25, D. C.

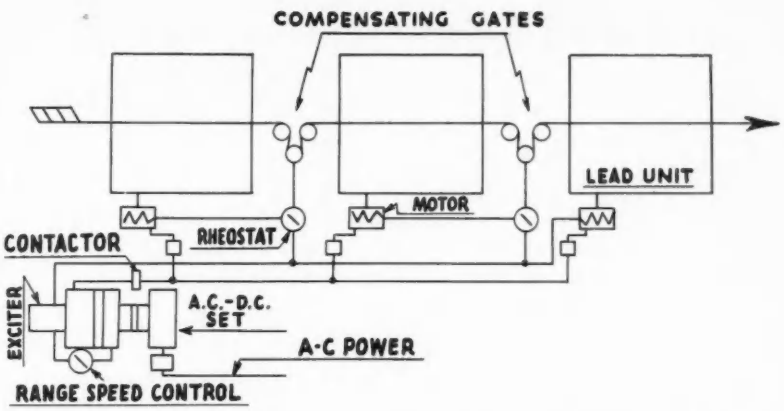
• F. & P. Instrumentation Course Set for Oct. 9-13

An instrumentation course covering manufacture, calibration, installation, operation and maintenance of primary and secondary process control instruments has been scheduled for October 9 to 13 by the Fischer & Porter Company at its Hatboro, Pa. plant. The company states that users of their line of "Flowrator" instruments will find the course particularly valuable.

Further details may be obtained by writing to the Fischer & Porter Company, East County Line Road, Hatboro, Pa.

• Providence Firm to Handle L. & W. Selling

Hampton Products, Inc., 703 Industrial Trust Building, Providence 3, R. I., have been assigned selling agents for the L. & W. Machine Works of Rock Hill, S. C., manufacturers of laboratory printing and dyeing equipment. (See "New Products" section for news of L. & W's laboratory print machine).



Sketch of AC-DC Drive Being Used on Riggs & Lombard Fleet Line Ranges

• R. & L. Using AC-DC Drive

Close control at any speed and exceptionally smooth acceleration are claimed for AC-DC drives now being used by Riggs and Lombard, Inc., Lowell, Mass., on their continuous washer, carbonizing ranges and other range equipment.

The drive reportedly gives a variable speed range and each unit in the range is kept in step with the preceding and following unit through counterweighted dance rolls, connected to rheostats. The manufacturer states that mills using the drive report very satisfactory results.

• GDC Changes Sales Structure

General Dyestuff Corporation has taken over the sales to all purchasers of the detergents, emulsifiers and chemical specialties, including Carbonyl Iron Powder, which have been handled by the Antara Products Division of General Aniline & Film Corporation. Jack Frye, president of both corporations, stated that the purpose of the change is "to coordinate the sales effort on these General Aniline products in one sales organization for maximum effectiveness."

General Dyestuff Corporation now consists of the Dyestuff Division, handling the sales of dyestuffs, and the Antara Products Division, handling all other nondyestuff products mentioned. The Dyestuff Division will continue to operate as before without change in personnel or policy.

The products manufactured by General Aniline and Film Corporation have been handled by General Dyestuff for twenty-five years.

• Correction on Atlas Electric Advertisement

The advertisement of Atlas Electric Devices Co., which appeared on pages II and III of the 1950 *Technical Manual and Year Book,* was incorrectly printed inasmuch as the right- and left-hand pages were reversed. The advertisement, which features the Launder-Ometer, the Fade-Ometer and the Weather-Ometer, is reprinted in this issue of the REPORTER with the pages in the correct position.

• Hatch Price Revisions

Hatch Textile Research, 25 E. 26th Street, New York 10, N.Y., has announced an upward revision of prices for about 50% of its tests, the first change in several years.

A new feature of the twenty-four year old laboratory's services will be a discount of 10% when five or more samples are received at one time for the same test.

A booklet covering the new prices has been made available.

• Quaker Enlarging Detroit Facilities

Contracts calling for approximately a fifty percent increase in Quaker Chemical Products Corporation's plant and storage facilities in Detroit have been given out. The move is made necessary because of increased business in the area, the company states. Completion is scheduled for the end of 1950.

Quaker's current Detroit plant and location is at 15330 Idaho Avenue.

• Fiftieth Anniversary, Niagara Alkali Company

Niagara Alkali Company, 60 East 42nd St., New York, N. Y. is celebrating its fiftieth anniversary. Organized in 1900 as the Roberts Chemical Company, Niagara has pioneered steadily in its field of electrochemistry, specifically in relation to chlorine and similar products. The company started with the ideas and some thirty patents of Isaiah L. Roberts, principal of which was an electrolytic cell diaphragm to withstand the destructiveness of basic chemical compounds in making caustic potash and bleaching powder.

Niagara tried out the first successful apparatus for chlorinating water supplies in 1912. Other "firsts" include the successful introduction of liquid chlorine for bleaching cotton textiles and the manufacture of synthetic caustic potash here. The flaking of alkalies was introduced with the flaking of caustic potash just prior to World War I, as a means of meeting German competition for this product, which then sold only in fused, broken and liquid forms. The company was the first to produce potassium carbonate, while it also first supplied hydrogen from electrolytic cells, for use in making ammonia. It was also one of the first to make monochlorobenzene and paradichlorobenzene.

The most recent addition to the company's line is trichlorethylene of high stability, used largely in metal cleaning and degreasing.

The current officers of the company are: J. Clarke Cassidy, president, S. Willard Jacobs, vice president, Stephen J. White, vice president and treasurer, and William J. Weed, manager of sales.

• Perlman Textile Course to Concentrate on Government Textile Procurement Program

A. M. Perlman, president of A. M. Perlman, Inc., sponsors of the Basic Textile Course which opened for its fifth year on September 27th, announced that the course will concentrate "to the greatest possible extent" on the U. S. Government Textile Procurement Program. The course is operated as a public service to the industry and there is no charge of any kind.

Lectures are held in the Willkie Memorial Hall, 20 West 40th St., every Wednesday from 11:30 A.M. to 1:00 P.M. through November 29th. Enrollment applicants for the remaining lectures are requested to write to Raymond Brush, A. M. Perlman, Inc., 1412 Broadway, New York 18, N. Y.

The following are cooperating by providing samples and literature for the course: Abney Mills; American Bemberg Corporation; American Viscose Corporation; Cotton Textile Institute; Dan River Mills, Inc.; E. I. Du Pont de Nemours & Co., Inc.; Greenwood Mills, Inc.; Industrial Rayon Corporation; National Association of Wool Manufacturers; National Plastics Company, Inc.; Owens-Corning Fiberglas Corporation; Tennessee Eastman Corporation; U. S. Department of Agriculture; United Yarn Products Company; Virginia-Carolina Chemical Corporation.

Harry Reimer, Editor of *Daily News Record*, was guest speaker at the opening session with Mr. Brush, a vice-president of the Perlman concern as instructor. The program included a description of textile fibers and a lecture, "The place of textiles in the U. S. Government Procurement Program".

The remainder of the schedule follows:

Oct. 4th. Yarns.

Oct. 11th. Sound Picture, 20 minutes. "Facts about Fabrics." General Weaving.

Oct. 18th. U. S. Army & Navy needs in textiles. Other flat fabrics.

Oct. 25th. Crepe Fabrics.

Nov. 1st. Spun Yarn Fabrics.

Nov. 8th. Testing & Identification. Analysis of basic fabrics used in government procurement program.

Nov. 15. Dyeing & Printing.

Nov. 22nd. Things to come in textiles.

Nov. 29th. Review of course, and Army and Navy Textile Procurement Program.

• Nopco to Manufacture Industrial Chemicals on West Coast

Thomas A. Printon, president of Nopco Chemical Company, Harrison, N. J. has announced plans for the manufacture of industrial chemicals on the West Coast. The company's Pacific Division will utilize two Nopco-owned plants in Richmond, Cal. Further expansion is made possible by Nopco's ownership of a large tract of land between them.

The plant at 1141 S. 14th Street is being converted to the manufacture of stearates and palmitates by Metasap Chemical Company, a wholly owned subsidiary. Equipment is now being installed for production, scheduled to begin after January 1. This building was formerly occupied by Rare-Galen, Inc., for the manufacture and packaging of pharmaceuticals before this subsidiary was sold by Nopco earlier in the year.

The plant at 1140 S. 10th Street, formerly devoted to vitamin oil processing, is being fitted for production of chemical processing specialties and agricultural products marketed through the company's Industrial Department. Complete installation is expected sometime in 1951. Present boiler house facilities will be able to handle the increased production, it is reported.

Overall activities of the Pacific Division are guided by Perc S. Brown, vice-president, assisted by Harold A. Swanson as general sales manager.

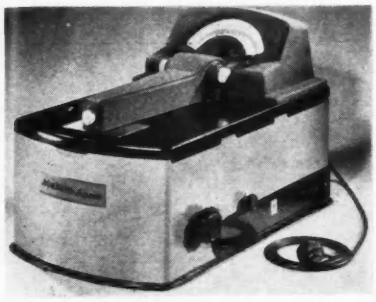
• Solvay Price Increases

Due to increased operating costs Solvay Sales Division, Allied Chemical and Dye-Corporation have increased their alkali, chlorine and ammonium chloride prices.

The new schedules f.o.b. maker's Works are as follows:

	Per 100 Lbs.
58% Light Soda Ash in bulk, carloads	$1.20
58% Light Soda Ash paper bags, carloads	1.50
58% Light Soda Ash barrels, carloads	2.05
58% Dense Soda Ash in bulk, carloads	1.30
58% Dense Soda Ash paper bags, carloads	1.60
58% Dense Soda Ash barrels, carloads	2.15
76% Solid Caustic Soda, in drums, carloads	3.35
76% Flake, Ground or Powdered Caustic Soda, in drums, carloads	3.75
50% Liquid Caustic Soda, seller's tank cars, basis 76%	2.55
50% Liquid Caustic Soda, Rayon Grade, seller's tank cars, basis 76%	2.65
70-74% Liquid Caustic Soda, seller's tank cars, basis 76%	2.65
70-74% Liquid Caustic Soda, Rayon Grade, seller's tank cars, basis 76%	2.75
Liquid Chlorine, single unit tank cars	2.70
Liquid Chlorine, mutiple units, 3 cars (45 tons) or more per year to one destination, contract customer only	3.20
Liquid Chlorine, multiple units, 2 cars (30 tons) per year to one destination, contract customer only	3.80
Liquid Chlorine, multiple units, 1 car (15 tons)	4.40
Liquid Chlorine, multiple units, less than 15 tons per year	4.75
Ammonium Chloride, in bags, carloads	5.00
Ammonium Chloride, in barrels, carloads	5.25

NEW PRODUCTS



Macbeth-Ansco Color Densitometer

• Macbeth-Ansco Color Densitometer

Accurate measurement of color densities in narrow spectral ranges, as well as visual densities over a wide range are reported easily accomplished with the new Macbeth-Ansco Color Densitometer, an ultra-sensitive precision photometer produced by the Macbeth Corporation, New-Burgh, N. Y. The company states that with accessory equipment, reflection densities of opaque samples and transmission densities of liquids can also be measured.

The instrument can be used as a control instrument in processes using a spectrophotometer, for color determination of solid surfaces, for measurement of color ranges in chemical reactions, and for many other applications.

For further information write Macbeth Corporation for Bulletin No. 144.

• New Isocyanate Made Available by Monsanto

The availability of ethyl isocyanate has been announced by Monsanto Chemical Company, St. Louis 4, Mo. The company has recently completed installation of enlarged facilities for the production of isocyanates at its Anniston, Ala., plant.

Other isocyanates which the company manufactures are phenyl isocyanate, octadecyl isocyanate and p,p' diisocyanatodiphenyl methane.

Monsanto has also announced price reductions on a related product, tolylene diisocyanate. At the same time it made the product available for the first time in 55-gallon drum quantities.

The isocyanates were developed industrially by the Germans during the last war.

A paper by Paul Legue, technical sales director of the company's Phosphate Division, on isocyanates is available on request. See "Trade Literature" Section.

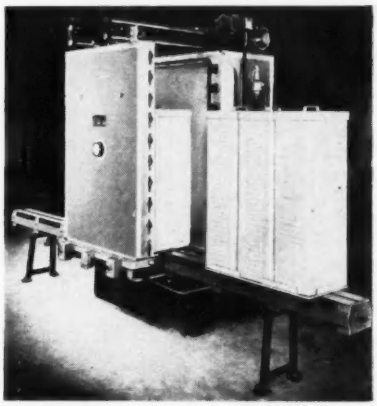
• Atco Graphite Remover

Atlantic Chemical Co., Inc., Centredale, Rhode Island, announces development of a graphite remover for use by lace manufacturers in removing graphite deposited on nylon in the loom. The product, Atco Graphite Remover, reverses the electrical charge of the carbon and washes it free. It is supplied in high and low viscosities to suit types of lace washing machinery. It is simply poured onto the lace in the washer, using just enough to saturate the lace. The machine is then allowed to run for ½ hour with light pressure on the squeeze rolls after which the remover is gradually diluted with water over a ten-minute period and then finally rinsed free. It is stated that this product has been successful in producing cleaner nylon in a much shorter time. Details and product samples are available.

• New Instron Jaws

Instron Engineering Corporation, 2 Hancock Street, Quincy 71, Massachusetts, announce a group of new type tensile testing machine jaws which are said to have greatly increased gripping efficiency and which minimize jaw breaks. It is stated that three important features of the new Instron Jaws combine to give these advantages: a resilient follow-up action, self alignment of the gripping faces, and positive restraint of motion of the gripping surface in the direction of pull. Three models are available: Model BJ with a load capacity of 5000 grams, Model CJ with a load capacity of 100 pounds, and Model DJ with a load capacity of 1000 pounds. A new Model AJ Jaw for testing of small fibers, wires, etc. is also being introduced. This model is extremely light, weighing approximately 10 grams, and has a load capacity of 50 grams. Literature on all jaws is available.

Model CJ Instron Jaw



Turbo Crimp Setter with Three-Can Carrier

• Turbo Crimp Setter

Production of 200-250 lbs. of crimp-set staple per hour is reported possible with the new Turbo Crimp Setter, a product of the Turbo Machine Company, Lansdale, Pa. Normal processing time is reported at about twenty minutes. Crimp setting of nylon staple or tow can be accomplished with no quality variations, it is reported.

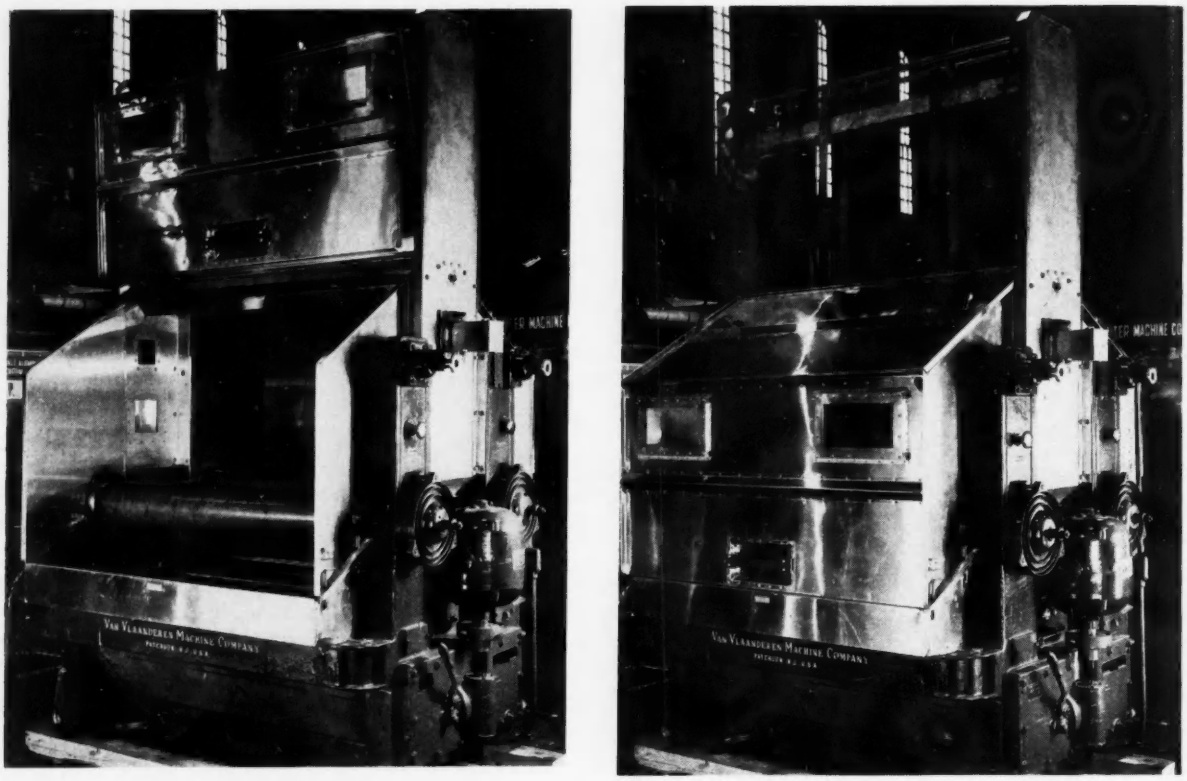
The machine is equipped with an electrical timing device which automatically shuts off steam, exhausts chamber through a jet exhaust valve and creates a vacuum which eliminates moisture from the nylon, the company states. After the vacuum period, the chamber is brought back to atmospheric pressure and the door opens automatically. Each lot remains in the steam retort a predetermined length of time.

The operator is required only to load and unload carriers. Steam consumption is reported at a minimum, as is loss in labor time, it is claimed.

Three standard types of carriers are available. The company builds special carriers to specifications.

• Acrylic Polymer Series Available

The Industrial Chemicals Division of American Cyanamid Company has announced availability of a series of acrylic polymers. These modified sodium polyacrylates are water-soluble anionic colloids, it is stated, available as clear straw-colored aqueous solutions. The thickening, suspending, stabilizing and film forming characteristics are described in a technical data bulletin. (See "Trade Literature" Section).



Blickman Stainless Steel Jig Enclosure in Open and Closed Positions.

• Blickman S. S. Jig Enclosures

Savings in steam, prevention of spotting, elimination of dye house fog with consequent savings in such maintenance costs as painting, etc. result through the use of Blickman-Built stainless steel jig enclosures, it is claimed by S. Blickman, Inc., Weehawken, N. J.

These enclosures are custom-built to fit any jig, it is reported, and are made entirely of stainless steel 316 SMO, including the side frame, for corrosion resistance. Ample illumination is provided by lamps in moisture-proof housings. The enclosures, precision built for close fit, are reported to be so designed that in the open position the roll is easily accessible. All Blickman jig enclosures have polished interiors facilitating simple and quick cleaning.

• Laboratory Print Machine

L. & W. Machine Works, Rock Hill, S. C., is manufacturing a laboratory print machine built of 16 ga. metal base cast iron side frames, with ¼ HP 110-220 gear reduction motor enclosed in the base. The machine operates at 12 r.p.m., requires approximately 5 sq. feet of floor space, is 55" high and weighs about 450 lbs. It has one feeding doctor and one cleaning doctor. Set is applied by screw.

Other features of the machine include a waste pan easily removed for changing, chrome plated shell, rubber covered top roll of 8" O.D. x 18" face, and W. Bore to fit mandrel on print roller. The engraved copper shell is a stripe approximately 1" wide spaced 1" apart.

• Dimethyl Chloroacetal

Dimethyl Chloroacetal, a bifunctional reagent produced by Anatara Products' Acetylene Derivatives plant in Grasselli, N. J., can be used in synthesis and as a source for chloroacetaldehyde. When bifunctional compounds are reacted with it, cyclic products can be produced, it is stated. (See news of data bulletin on this product in the "Trade Literature" Section).

• Carolina Aniline & Extract Granted Patents

The United States Patent Office recently granted registered trade marks to the Carolina Aniline & Extract Co., Charlotte, N. C., for their products, "Silver Glo" and "Humiclean".

"Silver Glo" is a finishing agent used on natural and synthetic fibers.

"Humiclean" is an antialgae and bacteria agent used as a fungicide in air conditioning units.

• Starch Soil Suspending Agent

National Starch Products Inc., 270 Madison Ave., New York 16, N. Y., has come out with a new starch product that acts as a suspending agent. The starch, called "Nu-Film", an acid ester derivative containing sodium carboxylate and sulfonate groups, is said to have marked ability as a solid suspending agent when used with detergents. Whiteness retention tests on unsized cloth are reported to show good performance in preventing redisposition of dirt on fibers, particularly when compounded with detergents of the alkyl aryl variety.

Nu-Film is reported suitable for warp sizing and finishing of cotton and rayon fabrics, with size removal possible without the aid of enzymes. The cost is said to be a fraction of that for other cellulose derivatives used as soil suspending agents.

PERSONNEL

Winston B. Strickland

WINSTON B. STRICKLAND has been appointed Southern Sales and Service Representative of the Hubinger Company, Keokuk, Iowa, corn starch products manufacturers, to increase company services in the Southeast. A graduate of Alabama Polytechnic Institute, Mr. Strickland has been with Lanett Bleachery & Dye Works, West Point, Ga.; Stein, Hall and Company, whom he represented in Georgia, Alabama and Tennessee; and, most recently, the Department of Agriculture's Southern Regional Research Laboratory in New Orleans.

STUART J. CANTER, formerly of the Polytechnic Institute of Brooklyn is now associated with Chemicals Procurement Company, New York, N. Y., chemical brokers and sales agents for specialty and intermediate chemicals.

ROBERT K. RIGGER, a Princeton graduate who was formerly with U. S. Industrial Chemicals Inc. in their special products sales department, has been named assistant manager, organic chemicals sales of the Michigan Alkali Division of Wyandotte Chemicals Corporation, Wyandotte, Mich., according to an announcement by Bert Cremers, vice president. Mr. Rigger joined Wyandotte in 1948 as assistant to the export manager and became manager of the export department on January 1, 1950.

Robert K. Rigger

The newly-established Market Development Department of Heyden Chemical Corporation has a new manager in DR. FRANKLIN T. PETERS. He comes from Glyco Products Company's Sales Department. DR. ARTHUR L. DAVIS, transferred from the Technical Sales Department, will be in charge of New Products Applications. Also assigned to the Market Development Department are: GEORGE H. WEICH (transferred from the Research Department) and ELY BALGLEY, formerly of the Resistoflex Corporation.

Tex-Chem Company, Fair Lawn, N. J. has announced the appointment of JULIUS SCHRAGER as Chief Chemist in full charge of technical operations, research and developmental activities. He will also serve customers as a consultant and demonstrator. Prior to joining Tex-Chem, Mr. Schrager was connected with Hart Products Company in a similar capacity.

Changes in the Operating Division of Mathieson Chemical Corporation have been announced by Carl F. Prutton, vice president, director of operations. R. B. WORTHY, vice president, formerly general manager of both the Saltville, Va., and Baltimore, Md., operations will now devote his entire time to the Saltville operations where he will make his headquarters. His new assignment will include supervision of the construction and operation of the new 6-million dollar electrolytic chlorine plant at Saltville. ARTHUR T. BENNETT, vice president, formerly general manager of Sasco operations with headquarters in Houston, has been appointed general manager of the Baltimore operations.

Mathieson's southwestern plants, formerly operated as a group, have been formed into separate operating divisions with the following management: JOSEPH MULLEN, JR., operating manager of the Little Rock, Ark., operations which consist of fertilizer and acid plants; H. T. GALT, assistant operating manager at Little Rock; JAMES S. GILLIAM, operating manager of the Sulphur Recovery operations with plants at McKamie and Magnolia, Ark.; R. T. BRAUN, operating manager, Southwestern Acid Plants operations, consisting of sulfuric acid plants at Port Arthur and Beaumont, Texas and Bossier City, La.; W. S. MILLER, operating manager and JOHN R. BEATTY, assistant operating manager of the Houston, Texas, operations which consist of fertilizer and acid plants at Pasadena, a sulfur plant at Houston and an engineering department for servicing all the southwestern plants.

C. W. French

The Pfister Chemical Works, Inc., Ridgefield, N. J., naphthols and dye intermediates manufacturers, have added C. W. FRENCH to their staff, according to an announcement by Dr. A. Pfister, president. He reportedly will work with A. BENDELIUS, vice president and secretary. A graduate of Dartmouth College, Mr. French had been with the Oldbury Electro-Chemical Company for the past 15 years, the last five of which he was manager of phosphorus compounds.

WILLIAM H. TROTTER has been appointed to handle the sales promotion activities of the Chemical Division of Celanese Corporation of America. He succeeds Robert D. Burleson, resigned. Mr. Trotter formerly was with Innis, Speiden & Co., and the Chemistry Departments of the University of Maryland and the Bureau of Standards.

FRANK KRAK has been appointed to the sales staff of the Hart Products Corporation, New York textile chemical manufacturers, and will represent the company in the metropolitan area. Mr. Krak was with Forstmann Woolen Company for seven years as an investigator and supervisor for raw wool scouring, wool grease recovery, continuous piece goods scouring and various finishing processes. He also acted as a trouble shooter in textile manufacturing processes.

Frank Krak

TECHNICAL LITERATURE

Technical Data Bulletin on Acrylic Polymers—an outline of properties and characteristics as well as discussion of compatability with surface active agents and colloids. Copies available from the Industrial Chemicals Division, American Cyanamid Company, 30 Rockefeller Plaza, New York 20, N. Y.

"Method of and Apparatus for Preparation and Distribution of Sizing Materials"—U. S. Patent 2,516,884. Description of a new method developed at the Southern Regional Research Laboratory. Copies may be obtained for 25 cents each from the U. S. Patent Office, Washington 25, D. C.

Isocyanates—a paper by Paul Logue, technical sales director of Monsanto Chemical Company's Phosphate Division, St. Louis 4, Mo., available on request. Development, characteristics, and applications of the isocyanates are summarized.

Bulletin No. 144—an information bulletin on the Macbeth-Ansco Color Densitometer. Published by the Macbeth Corporation, Newburgh, N. Y.

Nukemite—a booklet of Nukem Products Corporation, Buffalo 20, N. Y., describing this product, a synthetic resin, acid- and alkali-resistant coating. It is stated that Nukemite affords protection from severe corrosive conditions to metal, concrete and wood surfaces exposed to chemical attack. The resin film is said to be leak-prof, odorless and noncontaminating.

"Ucon" Textile Lubricants for Woolens and Worsteds—a new bulletin which presents the results of a two-year testing program and lists the advantages and physical properties of new water-soluble oils. Ucon textile lubricants H-6 and H-15 are said to be inherently soluble in water and have anti-static properties. Another Ucon synthetic oil, L-11, is water-dispersible. It is stated that their chief advantages are ease of application and scouring, nonstaining effect, and low concentration needed for woolen or worsted systems. Request a copy of Form A484 from Carbide and Carbon Chemicals Division, Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 14, New York.

Chemicals from Coal—a 44-page booklet issued by Koppers Company, Inc., Tar Products Division, Pittsburgh 19, Pennsylvania. Properties of fifty-eight commodity and specialty chemicals recovered in the coking of coal or derived from the distillation of coal tar are described. Data sheets present the physical and chemical properties of the coal derivatives and also suggest uses for the compounds. Request booklet T05-500.

A Subject Index—to technological documents issued in Volume 12 of the *Bibliography of Technical Reports* is available at $1 per copy from the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. The new index enables researchers to locate reports on any subject carried by the *Bibliography* in the period July-December, 1949. Subject headings are comprehensive and include trade names where appropriate. Indexes to Volumes 10 and 11 are also available at $1 each. The *Bibliography of Technical Reports*, issued monthly, lists additions to the O.T.S. collection of foreign and domestic technical reports. The collection now totals 150,000 items. Information on the contents in any particular field may be secured by writing O.T.S.

Economic Handling of Caustic Soda with Variable Area Meters—a booklet offered by Fischer & Porter Company, Dept. TB-21, County Line Road, Hatboro, Pennsylvania, which deals with the advantages of purchasing high-concentration caustic soda and diluting immediately during unloading, thus saving freight costs by shipment of less water. Special meter design, piping arrangements, dilution calculations and pump layout are also discussed in detail. Caustic uses throughout the plant are discussed, as well as meter banks for economical pumping, and control instruments used in maintaining pH are also developed.

English Translations—for the benefit of highly-specialized laboratories and individual chemists. They are offered by Consultants Bureau, 152 West 42nd Street, New York 1, New York of any article from the *Journal of General Chemistry* of the USSR, at $5 per article, and from the *Journal of Applied Chemistry* of the USSR at $7.50 per article. All 1949 issues of the *Journal of Applied Chemistry* are already translated and published in English as well as the January and February, 1950, issues of both journals. Orders for copies should cite title, author, and original Russian pagination of the article desired. The annual subscription rate to the complete English translation of the *Journal of General Chemistry* is $95 and to the *Journal of Applied Chemistry*, $80.

"Research Facilities Without Capital Investment"—a 20-page brochure designed to answer the question, "What is the function of the chemical consultant in today's industrial research?" This illustrated booklet outlines the relation of equipment and personnel of the consultant as well as the results to be expected on various type problems. It also gives specific answers to the queries, "Why use a consultant?", "What is research?", and "What can research buy?" Copies are available from Foster D. Snell, Inc., 29 West 15th St., New York 11, N. Y.

"Physical Properties of Synthetic Organic Chemicals"—1951 edition. This 16-page booklet, issued by Carbide and Carbon Chemicals Division, Union Carbide and Carbon Corporation, is a condensed guide for users of organic chemicals. It presents data on applications and physical properties of more than 250 synthetic organic chemicals in tabular form. Copies may be obtained from Carbide and Carbon Chemicals Division, 30 East 42nd Street, New York, N. Y. Ask for Form 6136.

"pH Electrodes, Assemblies, Parts nad Accessories"—a 28-page catalog presenting the complete line of Leeds & Northrup pH electrodes and assemblies for both industrial and laboratory applications. It lists the advantages of each type of electrode and shows each assembly and its components in tabular form. Also included briefly are the portable and permanently-mounted instruments—L & N indicators, and Micromax and Speedomax recorders and controllers—that are used with these electrodes. Write to Leeds & Northrup Company, 4934 Stenton Ave., Philadelphia 44, Pa. Ask for Catalog EN-S5.

"Eastman Cellulose Esters"—a 59-page expanded edition by Tennessee Eastman Corporation which includes information covering uses and specifications of Eastman cellulose esters, the compatability of these esters and solvents, resins and plastizers, and procedures of analysis. Write to Tennessee Eastman's New York office at 10 East 40th St.

Data Bulletin on Dimethyl Chloroacetal—an 8 page bulletin published by Antara Products, General Aniline & Film Corporation, 444 Madison Ave., New York 22, N. Y., available on request. It includes properties and characteristics of the new versatile reagent, a descriptive chart of representative reactions and a 41-item bibliography. Complete information on purification, stability and directions for use are given.

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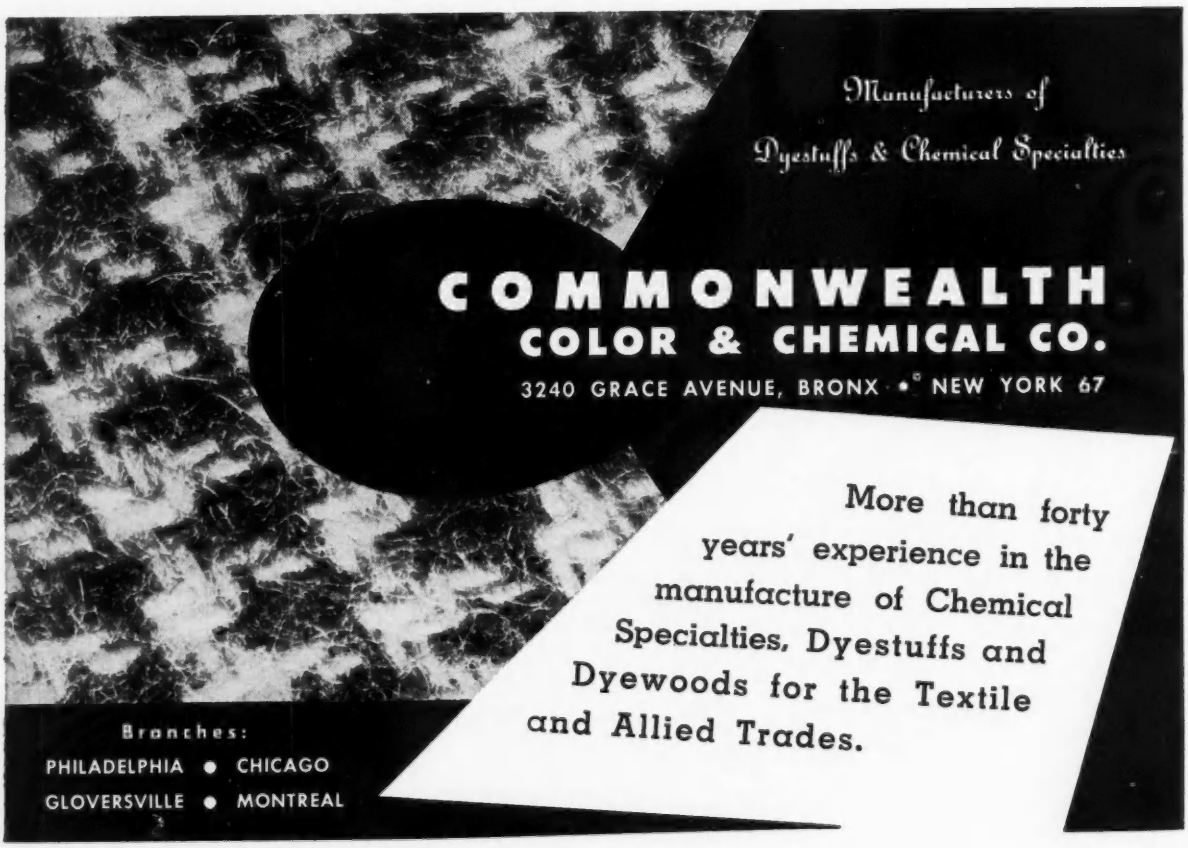

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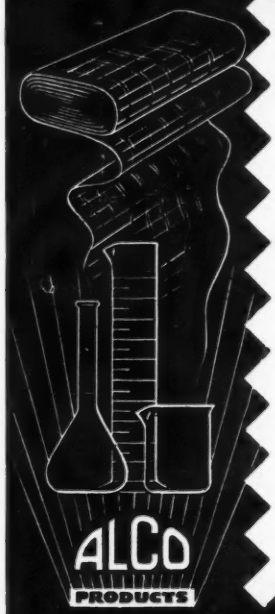

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WANTED: Plant chemist required for dyeing and finishing plant located in the South. Must be fully qualified to handle laboratory and operating problems on dyeing and finishing of synthetic woven fabrics, including nylon, acetate, viscose, and blends. Must have a thorough knowledge of shade matching on becks, jigs and continuous dyeing. Write Box No. 909.

WANTED: Textile Chemist for laboratory supervision and development work. Textile education required. Some practical experience in the dyeing and finishing of cotton piece goods preferred. Excellent opportunity for one with initiative. Centrally located. State age, education, experience, references and salary desired. Write Box No. 922.

TEXTILE CHEMIST—Large manufacturer of chemicals for the textile industry has opening in its application and product development laboratory. Desires young chemist with B.S. or M.S. degree. Prefers a man with a year or two of textile finishing experience. Location is Mid-Atlantic area. State background of training and experience in original inquiry. Write Box No. 920.

ASSISTANT DYER, preferable from the Carolinas, for new Tricot Finishing Plant, located in the south. Prefer man with Nylon full fashioned dyeing experience, with proven record of production, proven ability to manage help, and excellent in color matching. Prefer age 30-40 years. Reply in full giving details pertaining to education, experience and salary requirements. Write Box No. 923.

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WANTED: SOUTHERN DYESTUFF MANUFACTURER WANTS YOUNG TEXTILE CHEMIST WITH THREE TO FIVE YEARS' PRACTICAL EXPERIENCE IN DYEING, PRINTING AND FINISHING FOR WORK IN SALES-SERVICE AND NEW DEVELOPMENT LABORATORY. WRITE, GIVING FULL INFORMATION AS TO FORMAL EDUCATION AND EXPERIENCE, MARITAL AND MILITARY STATUS. Write Box No. 932.

POSITION WANTED: Expert dyer on acetate and rayon satins and taffetas, silk twills and nylon on jigs, rayon and cotton velvets, silk twills, drapes and upholstery on becks. Tricot knitted piece goods of all descriptions on becks. Also laboratory chemist and colorist with experience in standardization. Desires position with dyestuff manufacturer as a colorist or demonstrator. Or with mill where my varied experience will be useful. Will locate any section of U. S. A. with responsible firm. Married. Salary commensurate with responsibilities. Write Box No. 929.

WANTED: Young man or woman to work under direction in laboratory concerned with analysis and development of textile chemicals and their application. B.S. degree or equivalent and some further experience in organic analysis or textile work desirable but not essential. Write Box No. 928.

POSITION WANTED: Experienced dyer of all major fibers in the form of yarn, piece goods, and narrow fabrics on jiggs, boxes, Hussongs, Smith, Drum machines. B.S. in textile chemistry and coloring from Lowell Textile Institute. Laboratory experience in large dyestuff concern. At present employed as second shift dyer. Seek an opportunity with a promising future. Write Box No. 930.

WANTED: Graduate Chemist or Bacteriologist experienced in application of fungicides to textiles. Nuodex Products Co., Inc., 830 Magnolia Ave., Elizabeth, New Jersey. EL. 3-2345, Ext. 10.

TEXTILE SALESMAN: Well established organization desires salesman with at least five years' experience in cotton and synthetic slashing and finishing. College graduate desirable but not essential. Location in Canada. Please give details of education, experience and salary desired. Write Box No. 926.

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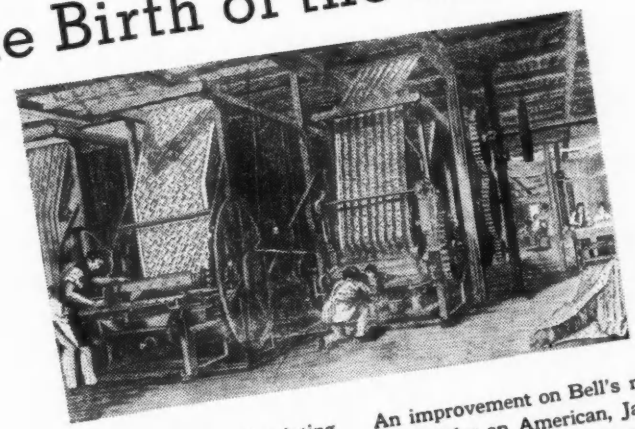

Before Thomas Bell's time, all printing had been done by means of wooden blocks or flat plates. In 1775, Bell, a somewhat mysterious Scottish gentleman, perfected the technique of wrapping engraved copper plates around wooden rollers, to make a continuous pattern on cloth. Obviously, the importance of Bell's invention hinged on the quick bleaching which was made possible earlier through the discovery of chlorine.

It is thought that Bell's machine was first used successfully in England by Sir Robert Peel in 1785. Though the first machine had one roller, the idea took hold so well that, by 1870, machines using 20 rollers were in operation both in Great Britain and in the United States.

An improvement on Bell's machine was devised by an American, Jacob Perkins, in the early 1800's. He invented a small steel cylinder to press designs on the copper roller—an economical way of covering it with the pattern and increasing the roller's usefulness. This process was introduced by Lockett in 1808, and is still being used for fine fabrics.

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All reputable organizations who are producing products used in DYEING, BLEACHING AND FINISHING are invited to send us information on all such products provided they were

PLACED ON THE MARKET SINCE NOVEMBER 1949.

THIS IS A FREE SERVICE TO OUR READERS BUT THE INFORMATION MUST BE RECEIVED BEFORE NOVEMBER 6th, submitted as follows:

Information should include: the trade name of the product and a BRIEF summary of its uses. Please list each product on a separate sheet of paper. If illustrations are necessary, glossy photographs or black ink drawings should be furnished. If the trade name is registered or the product is patented and you wish this indicated, please so note.

Incidentally, this issue is a very good one in which to advertise any products used in textile wet processing.

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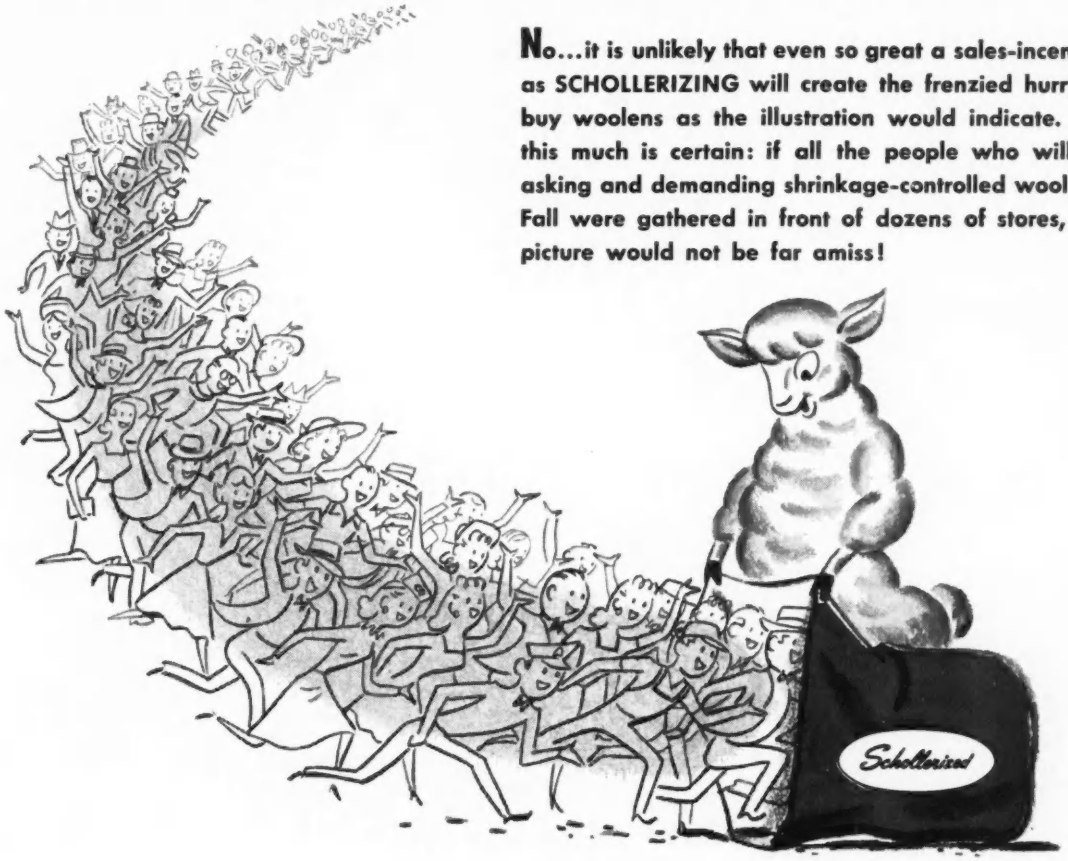

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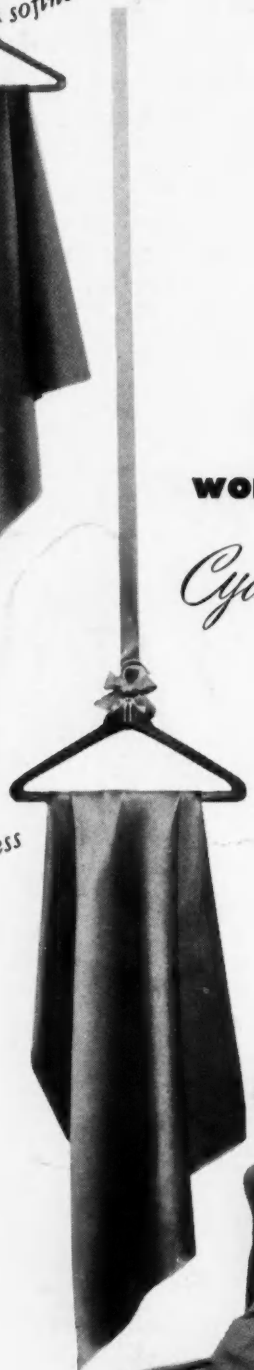

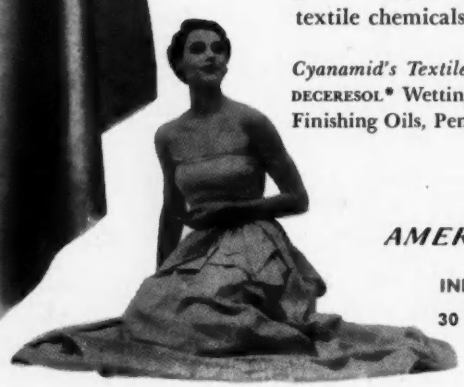

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